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ABSTRACT

This series of learning activity packages is based on a catalog of performance objectives, criterion-referenced measures, and performance guides for gardening/groundskeeping developed by the Vocational Education Consortium of States (V-TECS). Learning activity packages are presented in four areas: (1) preparation of soils and planting media, (2) propagation and planting, (3) cultural and environmental control practices, and (4) irrigation practices. Each of the fifteen learning activity packages follows a typical format: introduction; directions to the student; objective(s); learning activities; safety; equipment, tools, supplies needed; instructions; student self-check; final check-out activity; and instructor's final checklist. (LRA)

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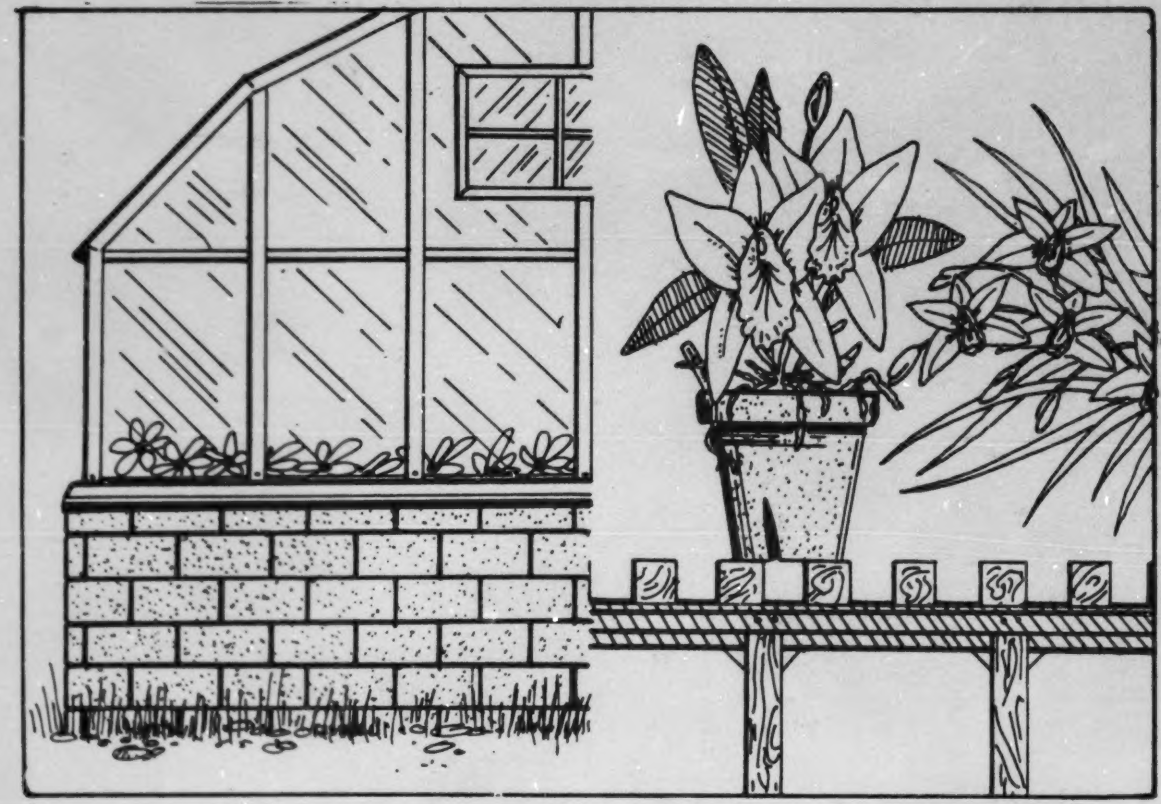
FLORICULTURE

Selected
Learning Activity Packages



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INTRODUCTORY STATEMENT

These fifteen learning activity packages are based on a catalog of performance objectives, criterion-referenced measures and performance guides for gardening-groundskeeping developed by the Vocational Education Consortium of States (V-TECS).

Only 15 of the 96 tasks listed in the V-TECS catalog were chosen for developing learning activity packages due to time limitation. Hopefully, other learning activity packages based on this catalog will be developed in the near future. Meantime these 15 packages may be incorporated into the present teaching program as feasible, or the instructors may choose to wait until all of the packages are developed and sequenced. The learning activity packages follow a typical format:

Introduction
Directions to the Student
Objective(s)
Learning Activities
Safety
Equipment, Tools, Supplies Needed
Instructions
Student Self-Check
Final Check-Out Activity
Instructor's Final Checklist

In most cases they are not content complete, i.e., they do not contain all of the information or instructions necessary to complete the task. They do, however, refer the student (very specifically) to such content. The references listed are therefore essential. Alternative references are usually listed and finally a blank line is left for the instructor to place an additional alternative reference available to the student. A listing of all publications referred to in these packages is listed on the last page.

Master copies of the Student Self-Checks and Instructor Final Checklists will be printed and provided to the instructor for recording student responses. Students should be reminded that they are not to write on any part of the learning activity packages.

ACKNOWLEDGEMENTS

Grateful appreciation is extended to the following persons who contributed to the development of these learning activity packages:

The writers were:

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The final copy was edited by Dr. R. J. Mercer, Vocational Instructional Materials Specialist, Vocational Education Media Center, Clemson, South Carolina.

FLORICULTURE

(Selected Learning Activity Packages)

Package Number

Preparation of Soils and Planting Media

Analyzing soil samples to determine pH levels 2
Analyzing soil samples to determine soluble salt levels 3
Shredding planting media 4
Screening planting media 5
Mixing media materials 6
Mixing fertilizer into media 10

Propagation and Planting

Removing rooted cuttings 26
Packaging cuttings for shipment 27
Labeling plants or cuttings 28

Cultural and Environmental Control Practices

Pinching flowering plants 29
Disbudding flowering plants 30
Repairing broken pipes, sprinkler heads, mist heads and/or valves 45
Applying liquid fertilizer 47

Irrigation Practices

Setting time clocks for automatic mist propagation system 52
Regulating trickle irrigation system (ooze system) 53

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Learning Activity Package No. 2

OCCUPATION:
Floricultural Workers

DUTY:
Media Preparation

TASK:

ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS

Objective No. 2

Ornamental Horticulture

INTRODUCTION

In the production of flower and foilage plants, it is often necessary to analyze soil samples to determine their pH levels. The pH is a measure of a soil's acidity or alkalinity. Too low or too high a pH may affect a plant's nutrition, causing poor growth and perhaps the death of the plant.

The plant grower who determines that the pH of the soil should be either more alkaline or more acid for the crop being grown can then add recommended soil amendments to change the pH level. In this learning activity package you will analyze soil samples and determine their pH.

DIRECTIONS

If you have completed this Learning Activity Package, read the objective below. If you feel you are already able to perform this task, read the Check-Out Activities. Then, either arrange with your instructor about doing the Check-Out Activities,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given three equivalent soil samples, an electric pH meter and a manual of instructions, determine the soil pH for each of the three samples. Readings on the three samples tested must agree within ± 0.1 pH unit.

LEARNING ACTIVITIES

1 REVIEW information on soil pH, using a reference recommended by your instructor. If available, either of the following may be used for review:

The Greenhouse Worker, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, Ohio 43210, p. 67.

or ______________________________

Fertilizing Farm Crops, South Carolina State Department of Education, Columbia, SC 29201, p. 72-73, 86-88.

or ______________________________

2 STUDY the Instruction Manual for the electric pH meter.

3 READ Instructions, ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS.

4 CHECK YOUR KNOWLEDGE of procedures by taking the Student Self-Check.

5 **ARRANGE** with your instructor to complete this learning activity package by going through the Check-Out Activities.

SAFETY

Take precautions in using electric pH meter, as with any electric appliance, to avoid hazards of electrical shock.

EQUIPMENT NEEDED

Electric pH meter

MATERIALS NEEDED

1. Glass test tubes, beakers, and stirring rod
2. Distilled water
3. Three soil samples

INSTRUCTIONS

(1) Review manual of instructions to determine the precise procedures to be followed in preparing samples.

(2) Prepare samples according to instructions for preparing a soil solution.

- a. Measure out 25 milliliters of sample (beaker measure is satisfactory).
- b. Add 50 milliliters of distilled water.
- c. Stir the mixture and let stand for 30 minutes, stirring occasionally.
- d. Stir vigorously, just prior to reading.
- e. Insert electrodes into prepared sample. CAUTION: Electrodes must be placed in the solution just above the soil, but must not come to rest in the soil.
- f. Record pH reading for each of the three samples.
- g. Clean and dry the equipment prior to its use by others, or storage.

STUDENT SELF-CHECK

ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS

DO NOT WRITE ON THIS SHEET

Answer the following:

1. A measure of the soil's acidity or alkalinity is called ________.
2. The neutral point on the pH scale is ____.
3. Numbers below the mid-point on the pH scale indicate that the soil is ________.
4. Numbers above the mid-point on the pH scale indicate that the soil is ________.
5. A material which will raise the pH when added to the soil is ________.
6. A material which will lower the soil pH is ______________________.
7. In preparing soil samples for testing, ____ parts of distilled water are added to each 1 part of soil.
8. Soil sample and distilled water mixtures should be allowed to stand ____ minutes after mixing, before completing the test.

CHECK-OUT ACTIVITIES

In order to finish this learning activity package you must be able to complete the task(s) listed below. As you go through each activity, your instructor will rate your performance using the Instructor's Final Checklist, ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS.

Three equivalent samples of soil and an electric pH meter will be provided. Test each of the samples and record the readings.

CORRECT RESPONSES

1. pH
2. 7.0
3. acid
4. alkaline
5. lime (or limestone)
6. sulphur (iron sulfate, aluminum sulfate)
7. 2
8. 30

DO NOT WRITE ON THIS SHEET

LAP 2

Student ______________________

Date ______________________

ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS

Instructor's Final Checklist

Check the student's performance in the following elements of analyzing soil samples to determine pH levels.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Readings on the three samples agreed within ±0.1 pH unit.	☐	☐	☐	☐
2. Reading agreed with the recorded reading.	☐	☐	☐	☐
3. All equipment was cleaned and dried prior to re-use or storage.	☐	☐	☐	☐

Learning Activity Package No. 3

OCCUPATION: Floricultural Workers

DUTY: Media Preparation

TASK:

**ANALYZING SOIL SAMPLES
TO DETERMINE
SOLUBLE SALTS CONTENT**

Objective No. 3

Ornamental Horticulture

INTRODUCTION

Controlling the soluble salts in the soil or other growing media is a continuous problem for most flower and foliage crop growers. Salts accumulate in the media primarily from applied fertilizers. Excessive amounts of these soluble salts will reduce the entry of water into plants and restrict their growth. If a grower can, on a regular basis, analyze soil samples for the salt content, many problems caused by either over-fertilization or under-fertilization may be avoided. In this learning activity package you will analyze soil samples to determine their soluble salts content.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activities. Then either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a soil sample, an instrument (Solu-Bridge or equivalent), and a chart for interpreting readings, determine the soluble salts in the sample. Readings must vary no more than ±5 percent from a prepared and pre-determined sodium standard solution.

LEARNING ACTIVITIES

1 READ the Instructions for Solu-Bridge (or equivalent) instrument.

or ______________________________

2 READ Instructions, ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALTS CONTENT.

or ______________________________

3 PRACTICE testing the soil sample. Follow the procedure outlined in the instructions.

or ______________________________

4 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

5 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activities.

SAFETY

No special safety precautions necessary.

EQUIPMENT NEEDED

Solu-Bridge (or equivalent) instrument.

MATERIALS NEEDED

1. Soil sample (air dry)
2. Distilled water
3. Filter paper
4. Glass funnel, stirring rod, and suction flask
5. Chart for interpreting instrument readings

INSTRUCTIONS

ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALT CONTENT

(1) Place portion of well mixed soil sample in funnel that has been lined with filter paper.

(2) Add distilled water until soil becomes saturated and begins to glisten.

(3) Connect funnel to suction flask.

(4) Draw off solution extract.

(5) Place electrodes from bridge in extract.

(6) Take reading.

(7) Use Bradenton Experiment Station Chart published in the June 1972 issue of the Florida Flower Grower, page 2-3. With the use of the chart determine the amount of soluble salts present in the sample. (See Instruction Sheets I and II.)

(8) Clean Solu-Bridge and store in accordance with manufacturer's specifications.

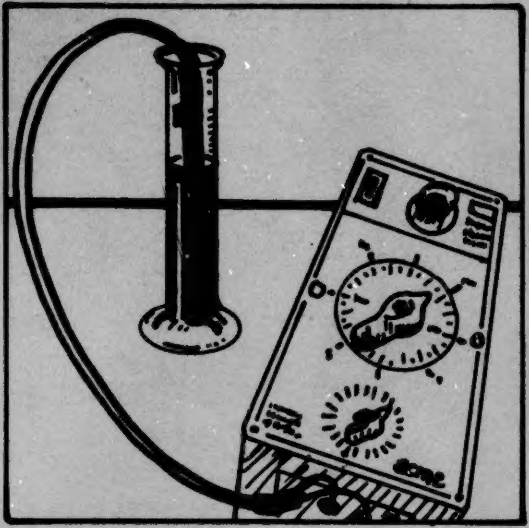


Figure 1. RD B15 Solu Bridge* soil tester designed to determine soluble salts content of soils. Calibrate especially for greenhouse soils, but can be used with nursery and field soils.

***No discrimination is intended and no endorsement implied by the use of this manufacturer's products. This product was used because of the data available.**

INSTRUCTION SHEET I

Interpretation of Soluble Salts Readings in the

1:2 Volume Procedure

In this procedure soils are analyzed for soluble salts by mixing 1 part by volume air dry soil to 2 parts by volume distilled water. This is read on the Solu-Bridge at 25 C. and results converted to ppm salts.

The Solu-Bridge is calibrated to read specific conductance of the solution from 10 to 1,000 mhos x 10^{-5} or 0.1 to 10 mhos x 10^{-3} for the newer models.

The ppm (parts per million) salts are calculated with the formula EC X 700 X 2 when

EC = electrical conductivity (Solu-Bridge reading)
700 = average factor for converting conductivity reading to ppm salts
2 = water volume dilution factor

EXAMPLE - Solu-Bridge reading was 0.48
.48 X 700 X 2 = 672 ppm salt

For a Solu-Bridge designed to read in mhos x 10^{-5} use a factor of 7 instead of 700. For light weight mixes with high water holding capacity it may be necessary to use a 1:4 mixture of soil to water. In this case a water dilution factor of 4 should be used instead of 2.

Table: Interpretation of Solu-Bridge readings with the 1:2 air dry soil to water volume method.

Media	Solu-Bridge reading mhos x 10 on 1:2 vol.	ppm salt*	salt rating	Remarks
(a) sandy soils	Below 25	0-325	low	Need fertilizer
(b) 1:1 peat:sand	Below 33	0-460		
(c) peat or light wt. mixes	Below 50	0-700		
(a) sandy soils	25 to 50	350-700	low to medium	Satisfactory for growth in upper range
(b) 1:1 peat:sand	33 to 66	460-925		
(c) peat or light wt. mixes	50 to 100	700-1400		
(a) sandy soils	50 to 100	700-1400	medium to high	Desirable salt range; no fert. needed, but light applications can be made
(b) 1:1 peat:sand	66 to 130	925-1820		
(c) peat or light wt. mixes	100 to 175	1400-2450		
(a) sandy soils	100 to 150	1400-2100	high to very high	Do not fert. or allow soil to become dry. Leach media if readings are near top of these ranges
(b) 1:1 peat:sand	130 to 200	1820-2800		
(c) peat or light wt. mixes	175 to 275	2450-3850		

* EC (Solu-Bridge reading in mhos x 10^{-5}) x 7 x 2 = ppm salt

INSTRUCTION SHEET II

Analyzing Soil Samples to Determine the Soluble Salts Content

Bench or container grown crops which are actively growing must be closely watched for nutrient deficiency. The soil or other growing media should contain the right amount of fertilizer at all times. The Solu-Bridge test for soluble salts, while it will not indicate the kind of fertilizer nutrients present or the kind needed, will give an indication of the total amount of fertilizer in the soil. If the test shows that there is an abundance of fertilizer present it is clear that more fertilizer should not be added. A low reading from a Solu-Bridge test would indicate a need for fertilizer.

In any testing procedure, test results should be reproducible. If a soil sample is tested more than once, the same result should be obtained each time. The testing techniques are highly important–the amounts or proportions of materials, time, temperature–all should remain uniform each time the testing procedure is repeated. Glassware and other equipment used in tests must be clean. After washing they should be rinsed in distilled water. Soil samples for testing should be obtained with care to insure that they are truly representative.

Salts accumulate in the media primarily from applied fertilizer. Small amounts come from decaying organic matter and some may be added in irrigation water. Where soil has been sterilized by steaming, the steaming may release toxic amounts of salts.

When soluble salt levels become too high, plant roots are damaged, reducing their ability to absorb water and nutrients. Symptoms of damage from excessive salt intake include stunting, yellowing of foliage, marginal leaf burn, wilting, and small flowers. If the salt concentration of the soil solution exceeds the concentration inside the plant roots, water is drawn out of the roots into the soil. This results in eventual death of the plant.

Where soils are found to contain excess soluble salts, growers may leach the soil with large quantities of water to remove much of the excess salt.

Florida Cooperative Extension Service, Florida Flower Grower, (June, 1972) Vol. IX, No. 6, pp. 2-3.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALT CONTENT

Answer the following True or False.

1. The flower or foliage plant grower can easily detect the presence of excess soluble salts in the soil from disease symptoms in the plants.

   True ___ False ___

2. The Solu-Bridge test for soluble salts will indicate to the grower the kind of analysis of fertilizer to use.

   True ___ False ___

3. When analyzing soil samples, materials used in the tests should be at a uniform, standard temperature.

   True ___ False ___

4. In testing soil or other growing media for excessive soluble salts, tap water is used for mixing with the soil sample.

   True ___ False ___

5. When analyzing for soluble salts by the soil to water volume procedure, the soil sample must be air dry when the test is made.

   True ___ False ___

6. It is possible to remove excess soluble salts from growing media by leaching with large quantities of water.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALTS CONTENT.

Your instructor will provide a soil sample and a Solu-Bridge. Prepare the required extract solution and determine the salt content of the soil sample.

CORRECT RESPONSES

1. False 2. False 3. True 4. False 5. True 6. True

DO NOT WRITE ON THIS SHEET

LAP 3

Student ______________________

Date ______________________

ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALT CONTENT

Instructor's Final Checklist

Check the student's performance in the following elements of analyzing soil samples to determine soluble salt content.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Directions were correctly followed in using the testing equipment.	[ ]	[ ]	[ ]	[ ]
2. Using a prepared and pre-determined sodium standard solution, a check showed a variation of no more than plus or minus 5 percent.	[ ]	[ ]	[ ]	[ ]
3. Using the chart for interpreting soluble salt tests, ppm salts were correctly calculated.	[ ]	[ ]	[ ]	[ ]
4. Test equipment was cleaned and stored correctly.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 4

OCCUPATION:
Floricultural Workers

DUTY:
Media Preparation

TASK:

SHREDDING PLANTING MEDIA

Objective No. 4

Ornamental Horticulture

INTRODUCTION

A uniform, pulverized, well aerated plant media is necessary for consistent, healthy growth of floriculture plants. Often the media is greatly improved by first putting it through a shredder or grinder. Shredding or grinding it breaks up coarse lumps or clods and removes any stones, sticks, or other debris that it may contain. In this learning activity package you will learn how to use a shredder or grinder to properly shred planting media.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given the required soil materials or medium to be shredded and the necessary tools and equipment, shred the planting medium. Planting medium must be shredded safely and thoroughly so that there are no lumps or unshredded materials.

LEARNING ACTIVITIES

1 READ the following:

Operating Instructions for the model of gas engine or electric motor on your shredder or grinder.

or ____________________

Operators Manual for the shredder or grinder you will operate.

or ____________________

Instructions, SHREDDING PLANT MEDIA.

or ____________________

2 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

3 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

1. Observe all CAUTIONS listed for the safe operation of the machine.
2. Wear safety goggles or face shield when shoveling medium into the machine.

EQUIPMENT NEEDED

1. Shredder or grinder for shredding and/or grinding soil and other planting media.
2. Safety goggles or face shield.
3. Shovel
4. Bin or other storage container or area

MATERIALS NEEDED

Soil materials or medium to be shredded

INSTRUCTIONS

(1) Bring materials to proper moisture levels, approximating 10 percent of "field capacity."

(2) Shovel medium into shredder, controlling the rate to conform to the horsepower and capacity of the machine.

(3) If the machine continually clogs or otherwise fails to satisfactorily process the material, follow manufacturer's recommendations for adjusting the equipment.

(4) Do not allow processed material to build up under the machine sufficiently to interfere with its operation.

(5) Place shredded medium in bin or other container.

(6) Dispose of plastic bags or other packaging materials and debris.

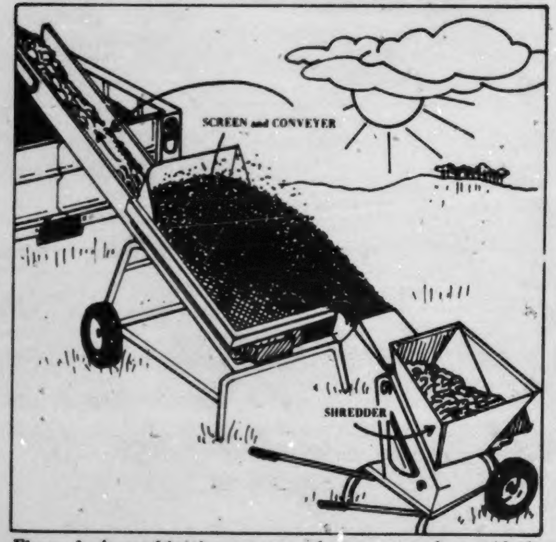


Figure 1. A combination screen and conveyer makes an ideal system of shredding, screening and loading.

STUDENT SELF-CHECK

SHREDDING PLANTING MEDIA

DO NOT WRITE ON THIS SHEET

Answer True or False.

1. A soil shredder or grinder is designed to reduce the size of large particles of media material to aid in obtaining more uniform plant growth results.
   True ___ False ___
2. Wet, soggy material can be easily shredded and aerated with a soil shredder or grinder.
   True ___ False ___
3. The rate at which material is fed into a shredder or grinder must be carefully controlled to prevent "lugging" or overloading the equipment's engine or motor.
   True ___ False ___
4. Gasoline powered engines must not be operated in an enclosed area.
   True ___ False ___
5. A gas engine powered shredder-grinder is designed to operate at the slowest possible engine speed.
   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITIES

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, SHREDDING PLANTING MEDIA.

A grinder or other suitable equipment for shredding the plant medium or other constituent materials will be provided. Shred the medium safely, uniformly and thoroughly.

CORRECT RESPONSES

1. True 2. False 3. True 4. True 5. False

DO NOT WRITE ON THIS SHEET

LAP 4

Student ____________________

Date ____________________

SHREDDING PLANTING MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of shredding planting media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. All safety precautions were followed.	☐	☐	☐	☐
2. Medium was shredded uniformly and thoroughly.	☐	☐	☐	☐
3. Medium from the shredder was properly stored.	☐	☐	☐	☐
4. All debris was properly disposed of.	☐	☐	☐	☐
5. Machine was cleaned.	☐	☐	☐	☐

Learning Activity Package No. 5

OCCUPATION:
Floricultural Worker

DUTY:
Media Preparation

TASK:

SCREENING PLANTING MEDIA

Objective No. 5

Ornamental Horticulture

INTRODUCTION

Soil used in growing floral crops should be free of large lumps, sticks, grass, leaves or other debris. If the soil contains large particles of debris, it is difficult to get a uniform mix when fertilizer and soil amendments are added. It is also difficult to get thorough soil sterilization. The result is a lack of uniformity in the plants grown in the soil. Some plants may be of poor quality with some not being salable. Very seldom can a grower obtain "topsoil," "woods earth," "field dirt" or whatever it is called locally, which does not contain considerable lumps or debris of some nature. In this learning activity package you will learn how to properly screen planting media to remove any debris.

DIRECTIONS

Before you begin work on this package, be sure you have completed Learning Activity Package 4, Shredding Planting Media.

If you have completed this Learning Activity Package, read the objective below. If you feel you are already able to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a soil medium, a shovel and a screen with openings sufficiently small to screen out lumps of soil, rocks or other debris, screen the medium. Medium must be free of all large chunks of soil, debris, sticks, grass, leaves or other large items.

LEARNING ACTIVITIES

1 READ Instructions, SCREENING PLANTING MEDIA.

or ____________________

2 CHECK YOUR KNOWLEDGE of screening planting media by taking the Student Self-Check.

3 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

Wear gloves if necessary to break up soil lumps with the hands.

If a screening machine is used, observe manufacturer's safety precautions. Remember – moving parts can catch loose clothing.

EQUIPMENT NEEDED

1. Screen made of ½ inch x ½ inch galvanized steel hardware cloth (1.27 cm)
2. Wheelbarrow, box or other receptacle
3. Shovel
4. Work gloves

MATERIALS NEEDED

A soil medium

INSTRUCTIONS

SCREENING PLANTING MEDIA

(1) Identify the medium to be screened. Ascertain that it is in "working" condition. If too wet or too dry it will be difficult to properly screen it.

(2) Place screen over a wheelbarrow, box or other receptacle.

(3) Using shovel, place successive shovelfuls of planting medium on screen, breaking the lumps up with the hands if necessary.

(4) Rescreen if necessary.

(5) Shake the screen to pulverize medium and to remove all debris.

(6) Dispose of debris in container.

(7) Clean and store equipment.

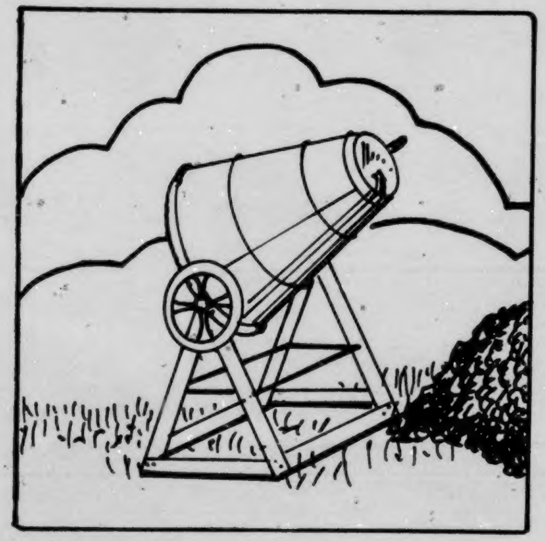


Figure 1. A concrete mixer can be used to mix media.

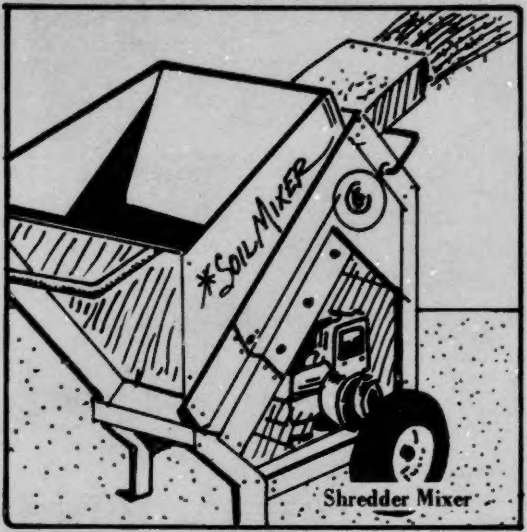


Figure 2. Larger commercial flower growers often use shredder mixers.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

SCREENING PLANTING MEDIA

Check the correct answer to each of the following statements.

1. If the medium in which floral crops are grown contains lumps and large particles of debris it can result in

   a. faster and larger growth of plants
   b. uneven or erratic growth of plants

2. When screening soil to remove debris,

   a. breaking up some lumps with the hands may be necessary
   b. it is not advisable to use the hands to break up clods or lumps of soil

3. Usually, sources of supply of clean soil, free of debris, and suitable without screening for use as a plant medium

   a. are readily available
   b. are not readily available

4. When potting plants, if the growing medium contains large lumps or large debris particles, it is

   a. more difficult to place seedlings or rooted cuttings in the pots and firm the medium rapidly

b. easier to place seedlings or rooted cuttings in the pots and firm the medium rapidly

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. b
2. a
3. b
4. a

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, SCREENING PLANTING MEDIA.

Your instructor will provide medium to be screened, a suitable screen and a shovel. Screen the planting medium.

DO NOT WRITE ON THIS SHEET

LAP 5

Student ______________________

Date ______________________

SCREENING PLANTING MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of screening planting media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Medium was pulverized.	[ ]	[ ]	[ ]	[ ]
2. Medium was free of				
(a) clods	[ ]	[ ]	[ ]	[ ]
(b) rocks	[ ]	[ ]	[ ]	[ ]
(c) sticks	[ ]	[ ]	[ ]	[ ]
(d) grass	[ ]	[ ]	[ ]	[ ]
(e) leaves	[ ]	[ ]	[ ]	[ ]
(f) other debris	[ ]	[ ]	[ ]	[ ]
3. Area was left clean and all equipment cleaned and stored.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 6

OCCUPATION:
Floricultural Workers

DUTY:
Media Preparation

TASK:

MIXING MEDIA MATERIALS

Objective No. 6

Ornamental Horticulture

INTRODUCTION

Many problems in the production of floriculture crops can be traced to the media in which they are grown. In an effort to eliminate these problems, much research has gone into the development of growing media mixtures. Some of the mixes contain soil with the addition of materials to increase the nutrients and improve the balance between the water-holding capacity and air-supplying ability. Also, the use of soilless mixes, or artificial soils, has increased in recent years, with some growers depending entirely on this type of growing media. Once a grower has determined one or more growing media mixtures which seem satisfactory under the growing conditions, he/she must be able to reproduce the same mixtures again. Therefore, accurate measurements of the components is necessary. Thorough mixing of ingredients is also important in order that uniform plant growth might be obtained. In this learning activity package you will learn to properly mix media materials.

DIRECTIONS

Before you begin work on this package, be sure you have completed Learning Activity Packages 4, Shredding Planting Media and 5, Screening Planting Media.

If you have completed these Learning Activity Packages, read the objective below. If you feel you are already able to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given the required materials, mixing ratios, and a mechanical mixer, if available, mix materials according to volume ratios specified. Ratios must be accurate to the nearest cubic foot per cubic yard for each ingredient used in the mix.

LEARNING ACTIVITIES

1 READ pps. 2-5 and Table 1, footnote 1, *Information Bulletin 43, Cornell Peat-Lite Mixes for Commercial Plant Growing.*

2 READ the manufacturer's manual for the shredder-mixer used.

or ____________________

3 READ Instructions, MIXING MEDIA MATERIALS.

4 CHECK YOUR KNOWLEDGE of how to mix media materials by taking the Student Self-Check.

5 ARRANGE with your instructor to complete this learning activity package by going through the CHECK-OUT ACTIVITY.

SAFETY

If a mechanical mixer is used, observe all safety instructions listed in Operator's Manual.

Watch the moving parts – DO NOT allow clothing near moving parts.

EQUIPMENT NEEDED

1. Mechanical mixer, if available
2. Shovel
3. Hoe
4. Scales for weighing fertilizer
5. Wheelbarrow or other suitable container, if mechanical mixer is not used (or the materials may be mixed on a concrete floor or other paved area)

MATERIALS NEEDED

Media materials as specified for the mix

INSTRUCTIONS

MIXING MEDIA MATERIALS

(1) Measure out the specified ratios of ingredients.

(2) Put ingredients into a mixing box, if mixing is to be done by hand, or a mechanical mixer.

(3) Mix uniformly with a shovel or garden hoe (unless using a mechanical mixer).

(4) If operating a mechanical mixer, the length of time required for mixing will vary according to type of mixer and other factors, but mixing should continue until no color or textural differences can be observed in the mixed medium.

(5) Store the mixed medium in a suitable container.

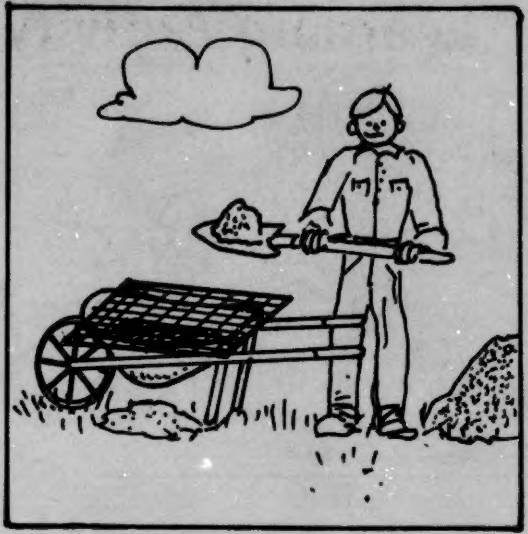


Figure 1. Small quantities of media can be screened by placing a screen (usually ¼" to ½" mesh hardware cloth)(.63 to 1.27 cm) over a wheelbarrow.

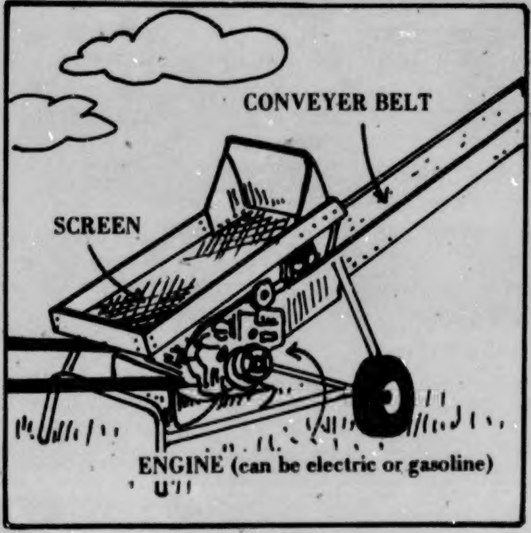

CONVEYER BELT
SCREEN
ENGINE (can be electric or gasoline)

Figure 2. A typical screen mixer and conveyer combination.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

MIXING MEDIA MATERIALS

Answer True or False.

1. For a satisfactory plant growing medium, it is usually necessary to mix together two or more media materials.

True___ False___

2. In mixing media materials, to have a satisfactory mixture time after time, accurate measurement of ingredients is important.

   True___ False___

3. When mixing media materials, mixing until there are no color or textural differences is an indication that a thorough mix has been obtained.

   True___ False___

4. Failing to get a uniform mixture when mixing a growing medium cannot cause erratic, uneven growth of plants grown in the medium.

   True___ False___

CORRECT RESPONSES

1. True 2. True 3. True 4. False

CHECK-OUT ACTIVITY

In order to finish this learning activity package you must be able to complete the task(s) listed below. As you go through each activity, your instructor will rate your performance using the Instructor's Final Checklist, MIXING MEDIA MATERIALS.

Prepare one cubic yard of the required medium.

DO NOT WRITE ON THIS SHEET

LAP 6

Student ____________________

Date ____________________

MIXING MEDIA MATERIALS

Instructor's Final Checklist

Check the student's performance in the following elements of mixing media materials.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Ingredients were measured accurately for the specified ratio.	☐	☐	☐	☐
2. Allowance was made for shrinkage in mixing ingredients of different particle size.	☐	☐	☐	☐
3. If dry peat moss was used in the mix, sufficient water was added to keep down dust and aid in handling.	☐	☐	☐	☐
4. A uniform mix was obtained, with no color or textural differences evident.	☐	☐	☐	☐
5. Medium was stored properly.	☐	☐	☐	☐

Learning Activity Package No.10

OCCUPATION: Floricultural Workers

DUTY: Media Preparation

TASK:

MIXING FERTILIZERS INTO MEDIA

Objective No. 10

Ornamental Horticulture

INTRODUCTION

In producing floriculture crops, it is often necessary to mix fertilizer with a growing medium with hand tools and equipment. To get a uniform mix without using too much time and effort requires that a plan be followed and care used. If the fertilizer and growing medium are not thoroughly and uniformly mixed, the plants grown in the mix may make erratic growth. In this learning activity package you will learn to mix fertilizer into a medium, using equipment available to any floriculture crop grower.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a medium granular fertilizer, shovel or hoe, and a wheelbarrow or other appropriate container, mix granular fertilizer into medium. Fertilizer must be thoroughly mixed into the medium in such a way that the chemical analysis of any random samples that could be taken would be approximately the same.

LEARNING ACTIVITIES

1 READ Instructions, MIXING FERTILIZERS INTO MEDIA.

2 READ manufacturer's directions if a shredder mixer is being used.

3 PERFORM the EXERCISES listed.

or ____________________________

4 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

or ____________________________

5 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

If a shredder-mixer machine is used, follow manufacturer's directions and watch for moving parts.

EQUIPMENT NEEDED

1. Wheelbarrow or other suitable container (materials can be mixed on a concrete floor, especially larger amounts)

2. Shovel
3. Hoe
4. Scales for weighing fertilizer

MATERIALS NEEDED

1. Growing medium
2. Granular fertilizer

INSTRUCTIONS

MIXING FERTILIZER INTO MEDIA

(1) Measure out fertilizer and meduim according to the ratios which are to be used.

(2) Put medium into a large box, wheelbarrow or other suitable receptacle. A clean, hard surface may also be used on which the materials may be mixed.

(3) Spread fertilizer on top of the medium.

(4) Using a hoe, shovel, or scoop, begin at the outer edge and gradually mix the fertilizer into the medium. Turn the pile about five times to assure a thorough mix.

(5) Clean equipment following use and store.

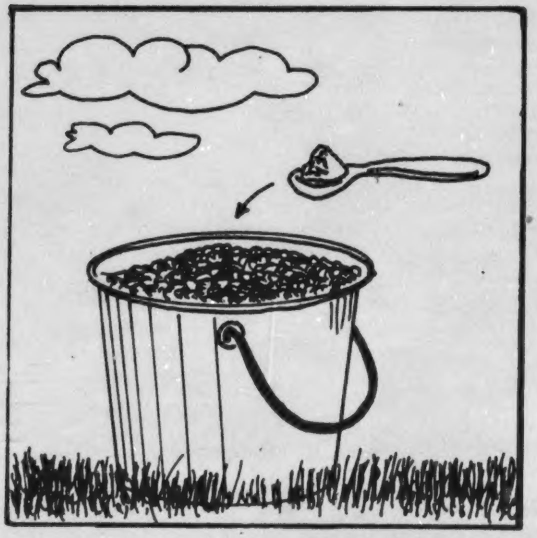


Figure 1. If only a small quantity of material (e.g., only 4 ounces of fertilizer) (113 g) is to be added to a large quantity of soil, premix the small amount in a bucket. Then add contents of bucket to the soil.

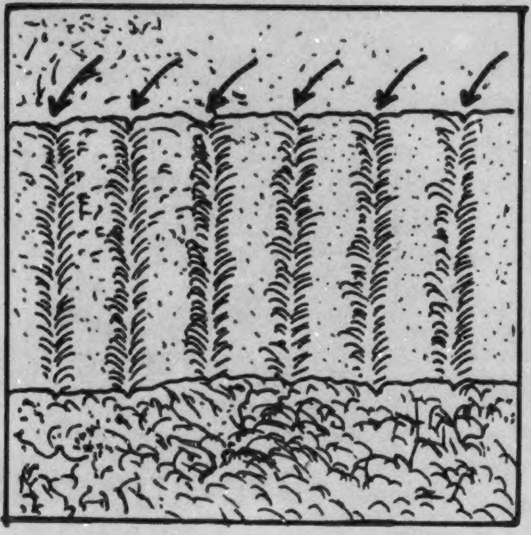


Figure 2. If the soil layer to be mixed is deep it may be helpful to place the fertilizer in trenches prior to mixing.

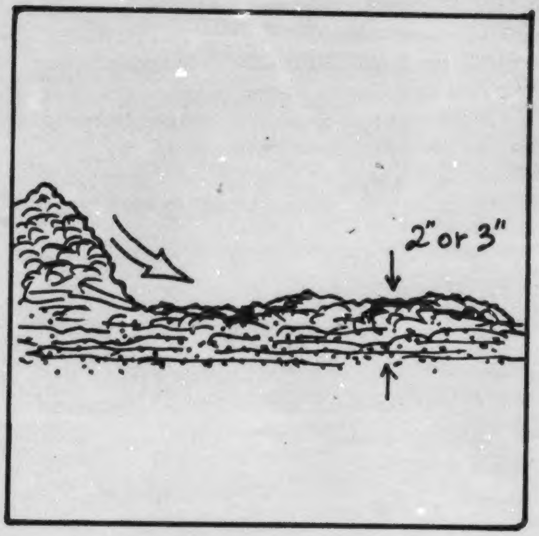


Figure 3. If possible spread the media evenly over a wide area to a depth of only 2 or 3 inches (5.08 to 7.62 cm), then add the fertilizer.

EXERCISE

Determining Volume of Materials

Often fertilizer recommendations are made in terms of cubic feet of soil. For this reason the florist needs to know how to determine volume of various mixing containers, storage bins, wheelbarrows, etc. in order to determine the amount of materials used. It may be helpful to practice determining some of these measurements by doing the following tasks:

a. Measure number of shovelfuls needed to make 1 cubic foot
b. Measure number of cubic feet of material per wheelbarrow load
c. Calculate number of wheelbarrow loads per cubic yard (27 cu. ft. = 1 cu. yd.)
d. Find weight of a gallon can of fertilizer of type being used
e. Find weight of fertilizer in bucket or other container which is used as a measure

STUDENT SELF-CHECK

MIXING FERTILIZERS INTO MEDIA

DO NOT WRITE ON THIS SHEET

Place a check mark before the correct answer in each of the following statements.

1. In growing floral plants, an excess of fertilizer in the growing medium would cause
   a. increased plant growth
   b. poor plant growth or plant death

2. In mixing fertilizer with soil or other growing media,
   a. a uniform mix can be obtained with hand tools
   b. a uniform mix cannot be obtained with hand tools

3. When mixing fertilizer into a growing medium, it is
   a. necessary to measure or weigh the fertilizer to obtain the proper fertilizer-medium ratio
   b. not necessary to measure or weigh the fertilizer

4. When mixing fertilizer into a growing medium with hand tools, the pile of material should be turned and mixed
   a. one time
   b. about five times

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, MIXING FERTILIZERS INTO MEDIA.

A growing medium, granular fertilizer, fertilizer/medium ratio to be used for mixing and the required equipment will all be supplied. Mix fertilizer into medium.

CORRECT RESPONSES

1. b 2. a 3. a 4. b

DO NOT WRITE ON THIS SHEET

LAP 10

Student ______________________

Date ______________________

MIXING FERTILIZERS INTO MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of mixing fertilizers into media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The medium and fertilizer were mixed in the ratio called for.	☐	☐	☐	☐
2. The mixture of fertilizer and medium was uniform.	☐	☐	☐	☐

Learning Activity Package No. 26

TASK:

REMOVING ROOTED CUTTINGS

Objective No. 26

Ornamental Horticulture

INTRODUCTION

When floral crops are propagated by rooting cuttings, the cuttings should be removed from the propagation bench or flats as soon as they have rooted. They must be removed from the rooting medium in order that they can be planted in benches, pots, or other containers so root development can take place where the plant is to be grown. In this learning activity package you will learn how to remove rooted cuttings from propagation beds or flats without damaging the cuttings.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a rooting bed or flat filled with rooted tip cuttings, remove 25 of the rooted cuttings by hand without causing unnecessary damage to the roots or to the foliage.

LEARNING ACTIVITIES

1 READ pages 122-123, 140 in *Flower and Plant Production in the Greenhouse*, Nelson, Kennard S.; Interstate Printers and Publishers, Inc., Danville, Illinois.

2 READ Instructions, REMOVING ROOTED CUTTINGS.

3 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

4 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

Be careful when handling the knife, if used.

EQUIPMENT NEEDED

1. Empty flat
2. Broad blade knife

MATERIALS NEEDED

1. Rooting bed or flat containing rooted tip cuttings
2. Damp sphagnum moss

INSTRUCTIONS

REMOVING ROOTED CUTTINGS

(1) Remove cuttings without damaging them by inserting the hand or a large, broad knife under the rooted cuttings and lifting them out of the bed or flat in which they have been rooted.

(2) Place cuttings in a flat or other container large enough to prevent damage to the plant and in which the cuttings can be kept moist with damp sphagnum moss around the roots.

(3) Store cuttings at appropriate temperature.

(4) Clean work area.

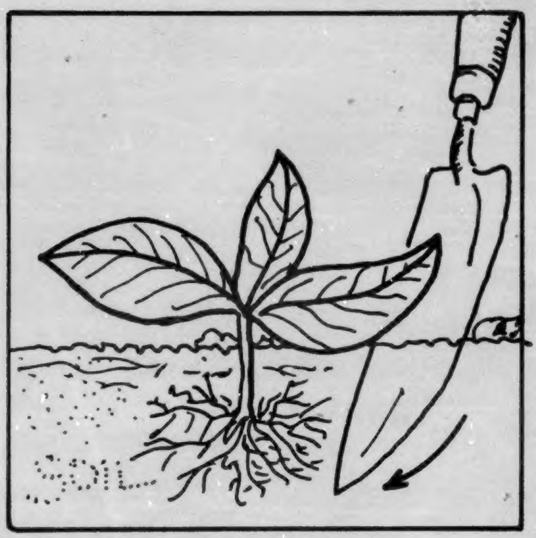


Figure 1. Remove cutting from the propagation bed by lifting from beneath the roots. A trowel or scoop is often used for this purpose. Do not remove by pulling the plants from the soil by the stem or leaves.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

REMOVING ROOTED CUTTINGS

Check the following statements either True or False.

1. Flower cuttings should be removed from the rooting bed or flat as soon as germinated.

   True ___ False ___

2. In lifting flower cuttings from the rooting bench or flat, the roots must receive support from below to prevent being damaged.

   True ___ False ___

3. Rooted cuttings must be kept moist.

   True ___ False ___

4. Refrigeration is not advisable for rooted cuttings which are to be held some time before planting.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, REMOVING ROOTED CUTTINGS.

Your instructor will provide a rooting bed or flat filled with cuttings. Remove 25 cuttings as directed for transplanting.

CORRECT RESPONSES

1. False 2. True 3. True 4. False

DO NOT WRITE ON THIS SHEET

LAP 26

Student ____________________

Date ____________________

REMOVING ROOTED CUTTINGS

Instructor's Final Checklist

Check the student's performance in the following elements of removing rooted cuttings.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The cuttings were free of damage caused by removing them from the rooting bed or flat.	[ ]	[ ]	[ ]	[ ]
2. The roots of cuttings were kept moist.	[ ]	[ ]	[ ]	[ ]
3. All of the cuttings selected had satisfactory root systems.	[ ]	[ ]	[ ]	[ ]
4. The correct number of cuttings (25) was selected.	[ ]	[ ]	[ ]	[ ]
5. The cuttings were stored at appropriate temperature.	[ ]	[ ]	[ ]	[ ]
6, The work area was cleaned.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 27

TASK:

PACKAGING CUTTINGS FOR SHIPMENT

Objective No. 27

Ornamental Horticulture

INTRODUCTION

Floral and foliage cuttings which are to be shipped must be carefully handled and correctly packaged if they are to arrive at their destination in good condition. Accurate count, neat labels, and uniform high quality plant material help insure that a satisfactory product is delivered. In this learning activity package you will acquire experience in the proper packaging of cuttings for shipment.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given floral and/or foliage cuttings, plastic sleeves and waxed paper boxes or other containers, package the cuttings for shipment. The number of cuttings in each bunch must not be short of a specified number, exceeding it no more frequently than 15 percent of the time.

LEARNING ACTIVITIES

1 READ Instructions, PACKAGING CUTTINGS FOR SHIPMENT.

or________________________________

2 STUDY floral supply catalogs for information on available containers and packing materials for shipping floral and foliage cuttings.

or________________________________

3 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

4 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

Deposit waste plant material, scrap packing material, and other debris in a waste container.

Handle tools and plastic bags with care.

EQUIPMENT NEEDED

None

MATERIALS NEEDED

1. Supply of cuttings
2. Plastic bags or sleeves
3. Waxed paper boxes or other containers
4. Newspaper, styrofoam chips, or other suitable packing material
5. Sealant tape
6. Waterproof pen

INSTRUCTIONS

PACKAGING CUTTINGS FOR SHIPMENT

(1) Identify cuttings to be packaged.

(2) Verify the number of cuttings per bunch and the total number per box.

(3) Select uniform cuttings of good quality and roll each bunch in waxed paper or place them in a plastic sleeve.

(4) Place the bunches in a packing box.

(5) Fill in the excess space with newspaper or other suitable packing materials to prevent cuttings from shifting about in packages.

(6) Close the container, seal and label.

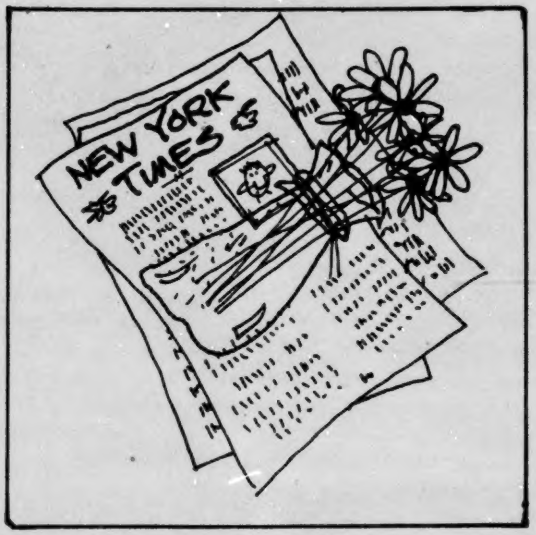


Figure 1. Wrap cutting in old newspaper or place in plastic bags. Make sure cuttings are kept moist.

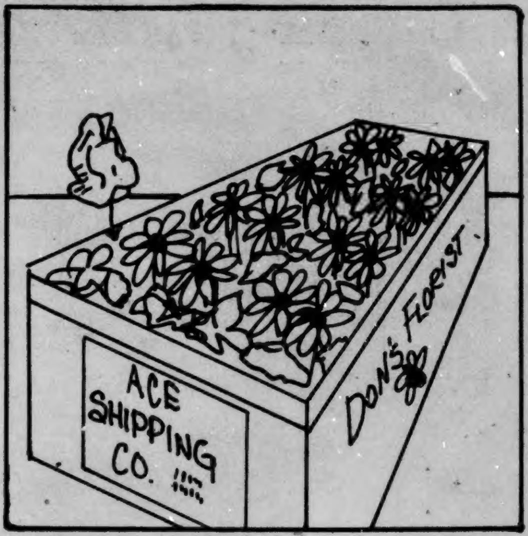


Figure 2. Add wads of paper to fill excess space in shipping carton.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

PACKAGING CUTTINGS FOR SHIPMENT

Check either True or False.

1. In packaging cuttings, an occasional shortage in count is permissible.

   True ___ False ___

2. In packaging cuttings, the cuttings should be uniform in size and quality.

   True ___ False ___

3. In packaging cuttings, they must be protected against drying out.

   True ___ False ___

4. In packing cuttings, excess space in containers should be filled with packing material to prevent cuttings from shifting about.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. False 2. True 3. True 4. True

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, PACKAGING CUTTINGS FOR SHIPMENT.

Your instructor will provide the cuttings to be packaged, orders to be filled, and all of the required boxes and/or other materials. Package the cuttings for shipment.

DO NOT WRITE ON THIS SHEET

LAP 27

Student ____________________

Date ____________________

PACKAGING CUTTINGS FOR SHIPMENT

Instructor's Final Checklist

Check the student's performance in the following elements of packaging cuttings for shipment.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The cuttings were correctly identified.	☐	☐	☐	☐
2. The count was correct.	☐	☐	☐	☐
3. The cuttings were uniform and of good quality.	☐	☐	☐	☐
4. All cuttings were packed so as to prevent drying out or other damage.	☐	☐	☐	☐
5. The packaging and labeling were neat and orderly.	☐	☐	☐	☐

Learning Activity Package No. 28

TASK:

LABELING PLANTS OR CUTTINGS

Objective No. 28

Ornamental Horticulture

INTRODUCTION

Unlabeled or improperly labeled plants or cuttings usually have little value to a grower. If the prospective purchaser cannot be assured of the correct plant variety, there is little demand for them. Legible labeling, sufficiently permanent to withstand the wear required of them, is an important production practice. Systematic and neat labeling also contribute to making a more readily saleable product. In this learning activity package you will acquire experience in labeling plants or cuttings.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given cuttings or plants in flats and the required labels, label the cuttings or plants. Writing on all labels must be clear and legible and arranged so that the plants in question are in back of and to the right of the labels.

LEARNING ACTIVITIES

1 READ Instructions, LABELING PLANTS OR CUTTINGS.

or ______________________

2 STUDY nursery and floral supply catalogs for information on available labels and marking devices.

or ______________________

3 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

4 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

Not applicable.

EQUIPMENT NEEDED

None

MATERIALS NEEDED

1. Supply of different varieties of cuttings in flats
2. Labels
3. Weatherproof marker

INSTRUCTIONS

LABELING PLANTS OR CUTTINGS

(1) Print or type labels legibly, indicating the relevant information for a particular species or variety.

(2) Follow a systematic procedure, inserting each label so that the plants it represents are in back of and to its right.

(3) Double check all labels to assure correct placement.

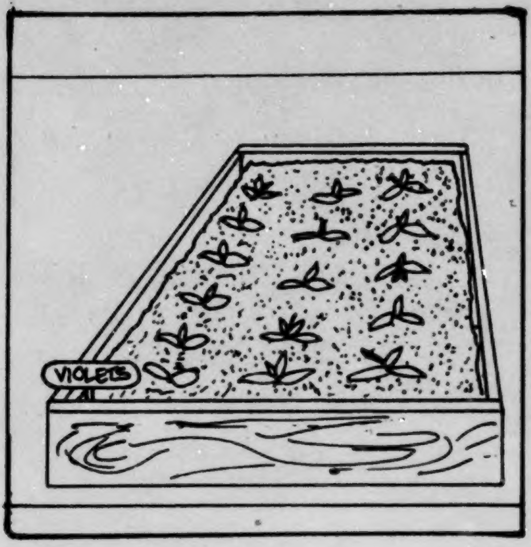


Figure 1. Place the label in the front left corner of the flat.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

LABELING PLANTS OR CUTTINGS

Answer the following statements.

1. Plants are labeled mainly for the benefit of

    a. the consumer
    b. the grower

2. When typing or writing out plant labels, write from the outside left end toward the middle of the label.

    True ___ False ___

3. Plant labels should be written with a weather-resistant type of marking device.

    True ___ False ___

4. In placing plant identification labels in flats, place the labels

    a. in front of the plants they identify
    b. behind the plants they identify

5. In identifying plants in a flat, place the labels

    a. on the left side of the flat
    b. on the right side of the flat

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, LABELING PLANTS OR CUTTINGS.

Your instructor will provide different varieties of cuttings and/or plants. Label the plants.

CORRECT RESPONSES

1. a 2. True 3. True 4. a 5. a

DO NOT WRITE ON THIS SHEET

LAP 28

Student ____________________

Date ____________________

LABELING PLANTS OR CUTTINGS

Instructor's Final Checklist

Check the student's performance in the following elements of labeling plants or cuttings.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: **All items must receive a rating of** FULLY ACCOMPLISHED (or Not Applicable). **If any items are rated** Not Accomplished **or** Partially Accomplished, **the student and instructor will discuss this and decide which learning activities must be repeated.**

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Each variety of cuttings or plants in the flats was correctly identified.	[ ]	[ ]	[ ]	[ ]
2. All labels were neat and legible.	[ ]	[ ]	[ ]	[ ]
3. The labeling was systematic, with each label inserted so the plants it represents is in back of and to the right of the label.	[ ]	[ ]	[ ]	[ ]
4. A weather-resistant type of marking was used on the labels.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 29

TASK:

PINCHING FLOWERING PLANTS

Objective No. 29

Ornamental Horticulture

INTRODUCTION

"Pinching", the removal of the tip or tips of the plants, is an important cultural practice in the production of many flowering plants. Pinching causes the plant to branch, resulting in a full bushy plant. The shoots that develop may also be heavier and stronger than if pinching were not practiced. The pinch must be correctly made and at the proper time if satisfactory results are to be achieved. In this learning activity package you will learn to properly pinch flowering plants.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given flowering plants in pots, beds or a field area and a pail or other receptacle, pinch the flowering plants. For plants 4 - 6 in. (10 - 15 cm) in height only about 4 to 6 leaves will be left on the pinched stem; on small plants only the very tip of the stem (about ½ in. – 1.3 cm) will be pinched.

LEARNING ACTIVITIES

1 READ *Flowers and Plant Production in the Greenhouse*, Nelson, Kennard S., Danville, Illinois, Interstate Printers and Publishers, Inc., 1967, pp . 56-60 and the pages listed as follows which apply to the crop which you will pinch:

Cut flower crops:

Carnation pp. 138-141-143
Chrysanthemum pp. 56-60
Rose 184, 186, 188-193
Snapdragon pp. 197-198

Pot plant crops:

Azalea pp. 58, 223
Chrysanthemum pp. 56-60
Geranium pp. 259-262
Hydrangea p. 265
Poinsettia pp. 272, 273-277

or

2 READ *The Greenhouse Worker*, Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, Ohio 43210, pp . 113-117, 119-122.

or ______________________________

3 READ Instructions, PINCHING FLOWERING PLANTS.

4 CHECK YOUR KNOWLEDGE by taking the Student Self-Check.

5 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

Not applicable.

EQUIPMENT NEEDED

A pail or other receptacle to receive severed plant tips.

MATERIALS NEEDED

A supply of plants for pinching

INSTRUCTIONS

PINCHING FLOWERING PLANTS

(1) Identify the flowering plants to be pinched.

(2) Grasp the stem tip and young immature leaves of each plant, snapping them from the plant by means of the thumb and forefinger.

(3) Accumulate the severed tips and leaves in the pail provided for that purpose and discard.

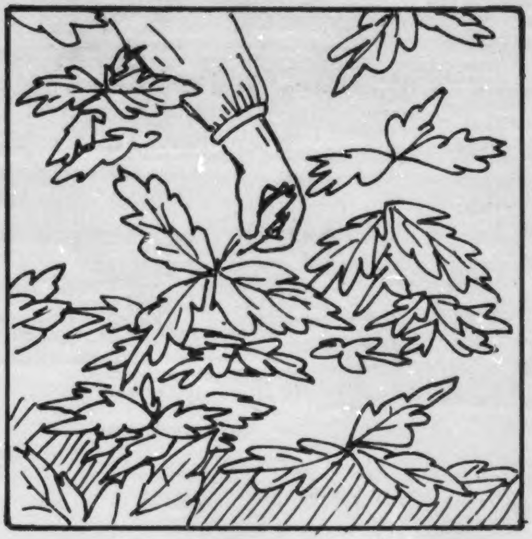


Figure 1. Pinching involves removal of only ¼" to ½" (.63 to 1.27 cm) of new growth on chrysanthemums.

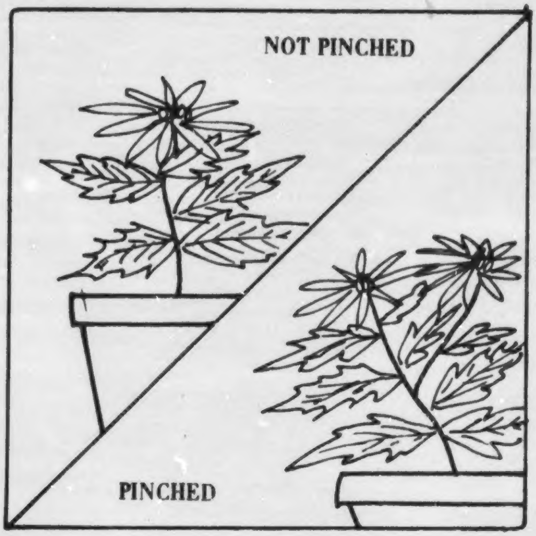


Figure 2. If poinsettias are not pinched they will usually produce only one flower per stem. When pinched they may produce several flowers.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

PINCHING FLOWERING PLANTS

Check the following statements either True or False.

1. Pinching causes a plant to branch, resulting in a narrow, slender plant.

   True ___ False ___

2. The shoots that result from pinching a plant are generally longer and weaker than those from a plant which has not been pinched.

   True ___ False ___

3. Pinching has approximately the same effect on all types of plants.

   True ___ False ___

4. Proper timing is important for successful pinching results.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, PINCHING FLOWERING PLANTS.

Your instructor will designate plants to be pinched and provide the receptacle. Pinch the plants.

CORRECT RESPONSES

1. False 2. False 3. True 4. True

DO NOT WRITE ON THIS SHEET

LAP 29

Student ______________________

Date ______________________

PINCHING FLOWERING PLANTS

Instructor's Final Checklist

Check the student's performance in the following elements of pinching flowering plants.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The correct amount of the plants was removed in pinching.	[ ]	[ ]	[ ]	[ ]
2. The foliage which remained was undamaged by the pinching.	[ ]	[ ]	[ ]	[ ]
3. The severed tips and leaves were placed in receptacle provided.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 30

TASK:

DISBUDDING FLOWERING PLANTS

Objective No. 30

Ornamental Horticulture

INTRODUCTION

To produce quality blossoms, flower growers sometimes use a process called disbudding. Not all flower species require the process, but there are some species where disbudding is a must if quality blossoms are to be produced. In this learning activity package, you will learn how to disbud flowering plants.

DIRECTIONS

Read the objective below. If you think you are already able to perform this task, read the Check-Out Activity. Then, arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given 6 or 8 flowering plants in the bud stage or a greater number growing in a bed, and the purpose or utility for which they are being grown, disbud the plants. Plants must be disbudded without any unnecessary damage and in such a way that their intended utility will be achieved.

LEARNING ACTIVITIES

1 READ "Disbud for Large Flowers" on page 271 of *Approved Practices in Beautifying the Home Grounds.*

or

2 READ "The Schedule Will Call for Disbudding" on page 25 of *Greenhouse Flowers and Bedding Plants for Agribusiness Studies.*

or

3 READ the section in *Ball Red Book* pertaining to the production of the plant assigned for you to disbud.

or ______________________________

4 READ Instructions, DISBUDDING FLOWERING PLANTS.

5 OBSERVE closely as your instructor demonstrates how to disbud flowering plants.

or ______________________________

6. CHECK YOUR KNOWLEDGE by taking the Student Self-Check, DISBUDDING FLOWERING PLANTS.

7 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activity.

SAFETY

None

EQUIPMENT NEEDED

None

MATERIALS

Flowering plants in the bud stage.

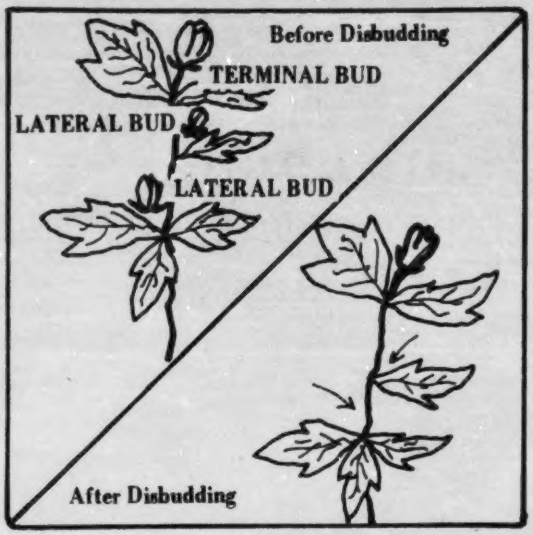


Figure 1. Lateral buds are often removed on chrysanthemums to allow development of the terminal bud.

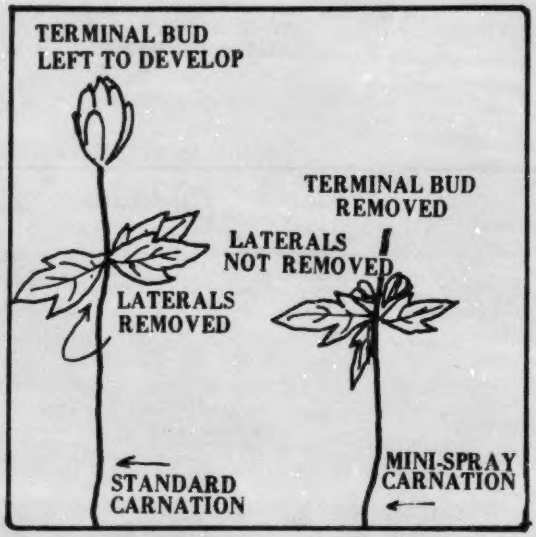


Figure 2. Usually lateral flower buds are removed (disbudded) on standard carnations leaving a single terminal flower bud. However, the opposite is true of the spray types or miniatures. On these carnations the big terminal bud is removed and the laterals allowed to develop.

INSTRUCTIONS

DISBUDDING FLOWERING PLANTS

(1) Determine purpose for which the plant is being grown.

(2) Pinch off buds using thumb and forefinger working systematically from one end of the bed to the other.

(3) Dispose of parts removed from the plants.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

DISBUDDING FLOWERING PLANTS

1. The only tool required for disbudding is the worker's hand.
   True ___ False ___

2. Disbudding usually refers to removing lateral buds to allow the terminal bud to more fully develop.
   True ___ False ___

3. Easter lilies are usually disbudded more often than any other flower crop.
   True ___ False ___

4. The specific purpose for which the flower crop is being produced will determine how it is to be disbudded.
   True ___ False ___

5. Disbudding can be done chemically by applying Cycocel approximately two weeks after the buds start forming.
   True ___ False ___

6. In the disbudding process, the worker should remove the terminal bud first and then systematically move down the plant.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. True 3. False 4. True 5. False 6. False

45

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this learning activity package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, DISBUDDING FLOWERING PLANTS.

Plants and the purpose or purposes for growing them will be supplied by the instructor. Disbud the plants.

DO NOT WRITE ON THIS SHEET

LAP 30

Student ______________________

Date ______________________

DISBUDDING FLOWERING PLANTS

Instructor's Final Checklist

Check the student's performance in the following elements of disbudding flowering plants.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The plants were disbudded correctly to satisfy the purpose for which the plants were being grown.	[ ]	[ ]	[ ]	[ ]
2. The thumb and forefinger were used to systematically remove the buds.	[ ]	[ ]	[ ]	[ ]
3. The buds that were removed were disposed of according to instructions.	[ ]	[ ]	[ ]	[ ]

Learning Activity Package No. 45

TASK:

REPAIRING BROKEN PIPES,
SPRINKLER HEADS,
MIST HEADS AND/OR VALVES

Objective No. 45

Ornamental Horticulture

INTRODUCTION

In any horticulture operation, there is some type of irrigation system. Periodically repairs and cleanings will be necessary so that equipment will operate properly. Often these repairs need to be done quickly to return the system to normal as soon as possible. The systems vary with type of operation and the degree of mechanization that a grower has. In this learning activity package, you will learn how to repair broken pipes, sprinkler heads, mist heads and/or valves.

DIRECTIONS

Read the objective below. If you think you are already able to perform this task, read the Check-Out Activity. Then arrange with your instructor about doing the Check-Out Activities,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a malfunctioning sprinkler or mist irrigation system, the necessary tools, equipment, and repair parts, check out the system, repairing or replacing any broken pipes, sprinkler heads, mist heads, valves and/or gaskets needing to be repaired or replaced. There are to be no leaks, clogged heads, or faulty gaskets or valves in the system when the task is finished.

LEARNING ACTIVITIES

1 READ the following:

The manufacturer's manual for the irrigation system you are using.

or ______________________

READ *Planning For An Individual Water System*, p. 133 for steps in connecting steel, copper, and plastic pipe.

2 CHECK YOUR KNOWLEDGE of repairing broken pipes, sprinkler heads, mist heads and/or valves by taking the Student Self-Check.

or ______________________

3 OBSERVE another student as he or she satisfactorily performs and is checked out on this learning activity package.

or ______________________

4 PRACTICE performing the task of repairing broken pipes, sprinkler heads, mist heads and/or valves.

5 ARRANGE with your instructor to complete this learning activity package by going through the Check-Out Activities.

SAFETY

No special safety precautions.

EQUIPMENT NEEDED

1. Welder's tip cleaner or wire
2. Pipe wrenches
3. Adjustable wrenches
4. Screwdriver
5. Vise
6. Pipe threader

MATERIALS NEEDED

1. Pipe, valve, sprinkler head and/or gaskets
2. Pipe compound

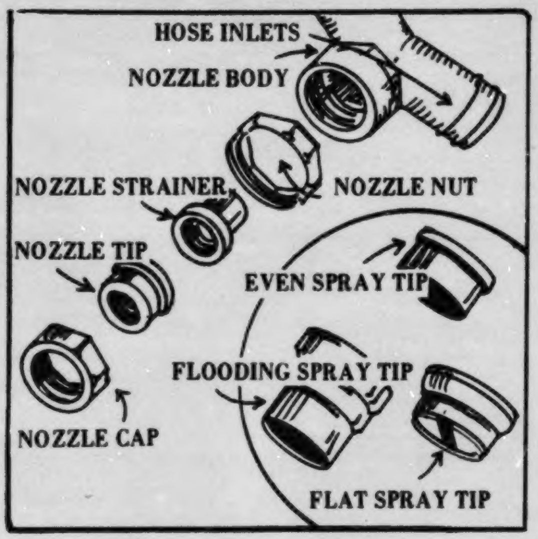


Figure 1. Typical spraying nozzle assembly.

INSTRUCTIONS

(1) Operate the system to identify malfunctions.

(2) Check to make sure all parts, materials, and tools are available.

(3) Locate main water supply valve and turn it off.

(4) Clean any clogged sprinklers or mist heads by rooting them out with a welder's tip cleaner or wire.

(5) Replace damaged pipes, valves, sprinkler heads, mist heads or faulty gaskets.

(6) Operate the system to make sure all necessary repairs and adjustments have been made.

(7) Clean all tools and equipment and return them to storage.

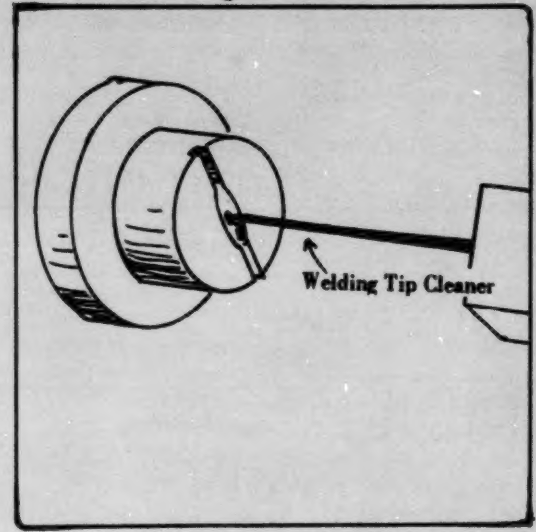


Figure 2. Cleaning a nozzle tip with a welding tip cleaner.

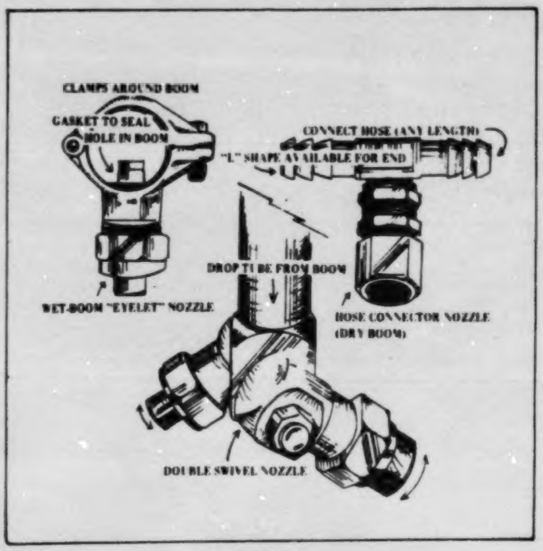

CLAMPS AROUND BOOM
GASKET TO SEAL HOLE IN BOOM
CONNECT HOSE (ANY LENGTH)
"L" SHAPE AVAILABLE FOR END
DROP TUBE FROM BOOM
WET-BOOM "EYELET" NOZZLE
HOSE CONNECTOR NOZZLE (DRY BOOM)
DOUBLE SWIVEL NOZZLE

Figure 3. Types of nozzle bodies and mountings.

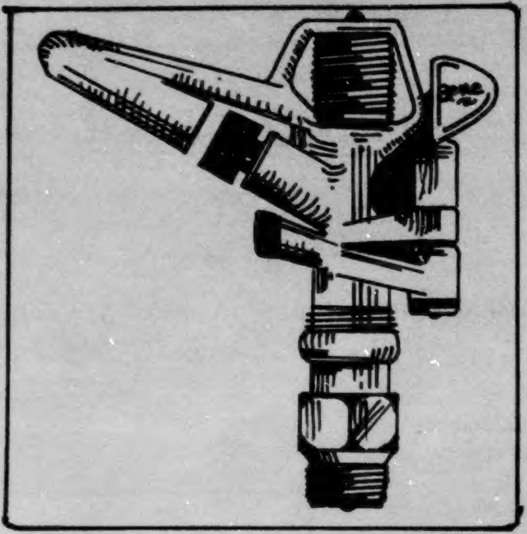


Figure 4. A typical sprinkler head. The impact of the water automatically rotates the nozzle.

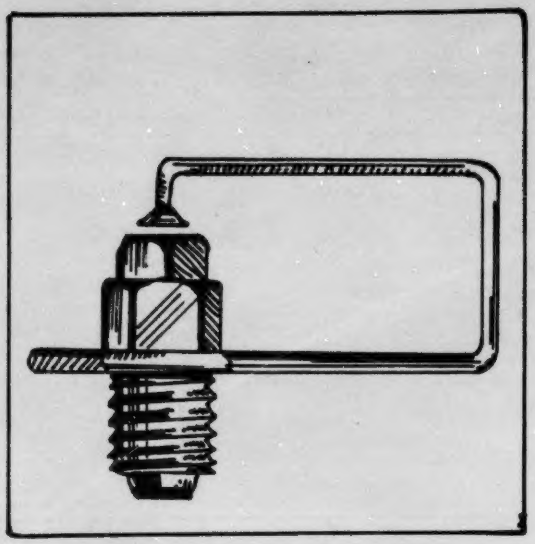


Figure 5. Fogger type nozzle.

STUDENT SELF-CHECK

REPAIRING BROKEN PIPES, SPRINKLER HEADS, MIST HEADS AND/OR VALVES

DO NOT WRITE ON THIS SHEET
Answer the following.

1. The more mechanized an operation is the more chance of break down.

   True ___ False ___

2. Which are more prone to become clogged:

   a. the mist sprinkler system

   b. the ooze system

3. Copper pipe is the only kind of pipe that can be used in greenhouse operations.

   True ___ False ___

4. Not only are leaks wasteful of water, they also make areas muddy and difficult to work in.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITIES

The statements below explain the activities you must be able to complete in order to finish this learning activity package. As you go through each activity, your instructor will rate your performance, using the Instructor's Final Checklist, REPAIRING BROKEN PIPES, SPRINKLER HEADS, MIST HEADS AND/OR VALVES.

Instructor will provide a malfunctioning irrigation system, and the necessary tools, equipment, repair parts. Make the necessary repairs.

CORRECT RESPONSES

1. True 2. mist sprinkler system 3. False 4. True

DO NOT WRITE ON THIS SHEET

LAP 45
Student ____________________
Date ____________________

REPAIRING BROKEN PIPES, SPRINKLER HEADS, MIST HEADS AND/OR VALVES

Instructor's Final Checklist

Check the student's performance in the following elements of repairing broken pipes, sprinkler heads, mist heads and/or valves.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. All malfunctions were identified.	☐	☐	☐	☐
2. Water supply was cut off.	☐	☐	☐	☐
3. Clogged sprinkler or mist head was cleaned and set.	☐	☐	☐	☐
4. Damaged parts were replaced.	☐	☐	☐	☐
5. System was tested and adjusted.	☐	☐	☐	☐
6. Tools and equipment were cleaned and stored.	☐	☐	☐	☐

Learning Activity Package No. 47

TASK:

APPLYING LIQUID FERTILIZER

Objective No. 47

Ornamental Horticulture

INTRODUCTION

In floriculture, the use of liquid fertilizers are very popular with pot plant crops. Fertilizers in liquid form are easier to apply and it is possible to make a uniform application readily. With proper equipment, one may simply add the nutrients to the water system and fertilize while watering. There are many types of devices used to apply liquid fertilizer. In this learning activity package, you will learn how to operate one for an automatic watering system.

DIRECTIONS

Read the objective below. If you think you are already able to perform this task, read the Check-Out Activities. Then arrange with your instructor about doing the Check-Out Activities,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a floral crop to be fertilized, an automatic irrigation system, liquid fertilizer, the desired ratios of fertilizer liquid to water, and an injection system, apply the liquid fertilizer mechanically to the floral crop. The liquid fertilizer must be applied in the amounts designated.

LEARNING ACTIVITIES

1 READ one of the following:

Flower and Plant Production in the Greenhouse, p. 89-92.

or ______________________________

Ball Red Book, p. 164-168.

or ______________________________

Information pertaining to the particular injector system that you are using.

2 CHECK YOUR KNOWLEDGE of applying liquid fertilizer by taking the Student Self-Check.

or ______________________________

3 OBSERVE another student as he or she satisfactorily performs and is checked out on this learning activity package.

or ______________________________

4 PRACTICE performing the task of applying liquid fertilizer.

5 **ARRANGE** with your instructor to complete this learning activity package by going through the Check-Out Activities.

SAFETY

No special safety precautions.

EQUIPMENT NEEDED

1. Automatic irrigation system
2. Fertilizer injection system

MATERIALS NEEDED

1. Liquid fertilizer
2. Floral crop

INSTRUCTIONS

(1) Determine the amount of irrigation water to be applied for unit area of crop.
(2) Determine the amount of liquid fertilizer required to give the desired ratios.
(3) Inject liquid fertilizer into irrigation system in accordance with requirements.
(4) Time the irrigation to apply the required amounts of fertilizer.
(5) Flush the system following use to prevent corrosion and deterioration of system. CAUTION: If detergent is used in flushing, select a detergent that will not harm the crop.

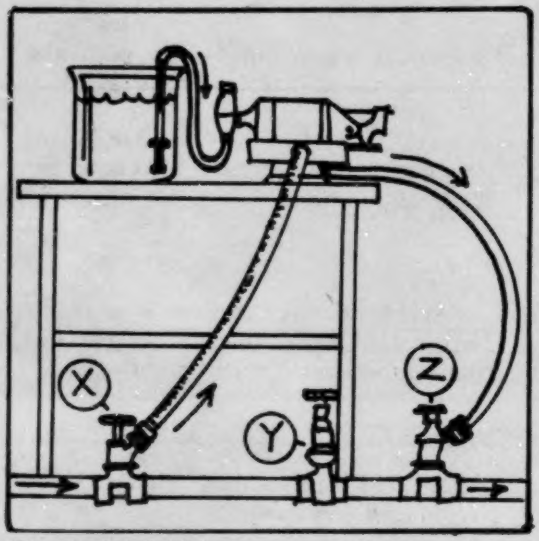


Figure 1. A typical injector-type pump. If the pump is installed in a by-pass arrangement, the water line should be valved as shown with valves X, Y, and Z. If the pump is to be installed at the end of a water line, valve V should be placed at the end of the line and valves Y and Z omitted.

STUDENT SELF-CHECK

APPLYING LIQUID FERTILIZER
DO NOT WRITE ON THIS SHEET
Answer the following.

1. Which of the following forms of fertilizer is easier to apply for most floricultural crops?
   a. granular
   b. liquid

2. Which of the following forms of fertilizer can be applied most uniformly?
   a. liquid
   b. granular

3. If not cleaned out, the injector system and irrigation system may corrode.
   True___ False___

4. Which of the following fertilizer ingredients would be least water soluble and therefore best applied in the solid (granular) form?
   a. nitrogen
   b. phosphorus, potassium

5. Of the three systems used, pump, siphon or injector, the best one is the injection system.
   True___ False___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITIES

The statements below explain the activities you must be able to complete in order to finish this learning activity package. As you go through each activity, your instructor will rate your performance, using the Instructor's Final Checklist, APPLYING LIQUID FERTILIZER.

Your instructor will designate the amount of fertilizer, provide the liquid fertilizer, the automatic irrigation and injector systems. Apply the liquid fertilizer.

CORRECT RESPONSES

1. b 2. a 3. True 4. b 5. True

DO NOT WRITE ON THIS SHEET

LAP 47

Student ______________________

Date ______________________

APPLYING LIQUID FERTILIZER

Instructor's Final Checklist

Check the student's performance in the following elements of applying liquid fertilizer.

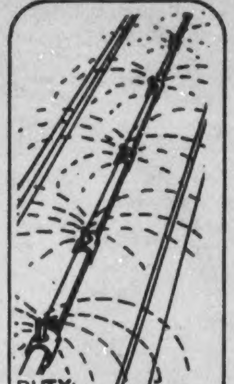
Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	Proper amount of water was determined.	☐	☐	☐	☐
2.	Fertilizer was injected into the irrigation system.	☐	☐	☐	☐
3.	The correct amount of water was applied.	☐	☐	☐	☐
4.	Injection system and irrigation system was cleaned.	☐	☐	☐	☐
5.	Materials and tools were properly stored.	☐	☐	☐	☐

Learning Activity Package No. 52

OCCUPATION: Floricultural Workers



DUTY: Irrigation Practices

TASK:

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

Objective No. 52

Ornamental Horticulture

INTRODUCTION

Time clocks and interval timers are widely used to automatically control the operation of humidifying or misting systems in plant propagation. With mist, many plants will root more quickly and with a higher percentage taking root, than without the use of mist. In operating the mist system, the operator may wish to apply mist only during certain hours (for example, during the period when evaporation is the highest). A control clock can take over this chore seven days a week. The interval of misting may also vary from season to season. For example, when cuttings are first placed in the propagating medium the interval of misting is usually longest; later, as roots begin to form, the interval of misting may be reduced. A second timer can be used in the system and adjusted to control this interval. In this learning activity package you will learn to set time clocks for an automatic mist propagation system.

DIRECTIONS

Read the objective below. If you think that you are ready to perform this task, read the Check-Out Activity. Then, either arrange with your instructor about doing the Check-Out Activity,

or

If you need further training in order to do the task, go through the Learning Activities in the order given.

OBJECTIVE

Given a mist propagation system and five different time interval settings for the time clocks, set the clocks to activate the system in accordance with the prescribed times. The system must function accurately with no more than 10 percent variation from the prescribed time intervals.

LEARNING ACTIVITIES

1 READ Instructions, SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM.

or____________________________

2 READ the descriptive information of Timers and Time Clocks in a greenhouse or other horticulture supply catalog.

or____________________________

3 READ the Operating Instructions for both the Time Clock and the Short Interval Timer for which you will make time settings.

or____________________________

4 PRACTICE setting time clocks by performing the Practice Exercises.

5 **CHECK YOUR KNOWLEDGE** on the setting of timers by taking the Student Self-Check.

6 **ARRANGE** with your instructor to complete this learning activity package by going through the Check-Out Activities.

SAFETY

Mist systems by their nature must be operated under moist conditions. DO NOT stand on a wet floor or damp ground and attempt to adjust electric clocks or controls while the electricity is on. To avoid any risk of shock be certain that the current to the timers is turned OFF before making any adjustments.

EQUIPMENT NEEDED

1. Time clock (24 hour dial)
2. Short interval (fast cycle) timer

MATERIALS NEEDED

None.

INSTRUCTIONS

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

(1) Identify the five desired time settings.

(2) Locate the time clocks.

(3) Turn off electric power to the clocks before making adjustments.

(4) Move the 'on' indicator on the 24 hours clock to the time desired for starting the misting cycles and the 'off' indicator to the time when the misting is to stop.

(5) Ascertain that the clock is set to the correct time of day.

(6) Set trippers on the short interval time clock to obtain the desired misting schedule intervals.

(7) Turn on electricity so clocks will operate.

(8) Check the system with a watch, making required adjustments in the settings with electricity turned OFF. Return system to ON for operation.

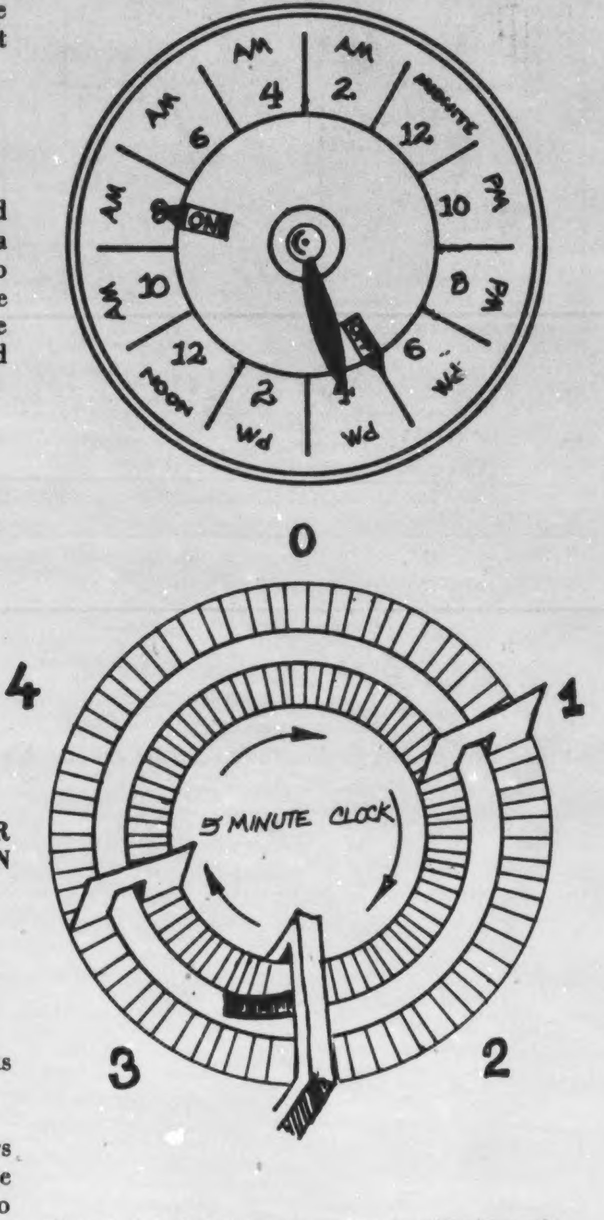


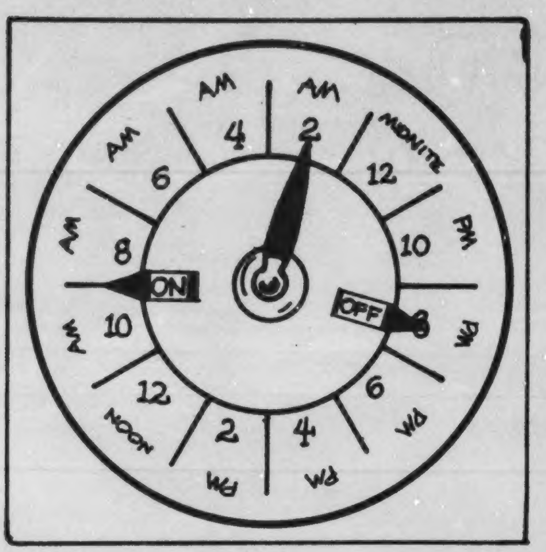
Figure 1. A typical timing arrangement for triggering a mist system. Note that the 24 hour clock is used to set the time each day for the irrigation system to come on and go off. For example the tabs on the 24 hour clock are set to go on at 8 AM and off at 5 PM – See the 24 hour clock. The 5 minute clock is used to set the interval between mists – the maximum interval is, of course, 5 minutes. The intervals are set by inserting tabs. For example, the clock set here is for a 2½ minute interval. And finally, the length of time the mist will be emitted once triggered can be adjusted by adding more tabs at each interval.

PRACTICE EXERCISE

1. At what time will this irrigation system come on?

2. At what time will this irrigation system go off?

3. What time is presently indicated by the clock?

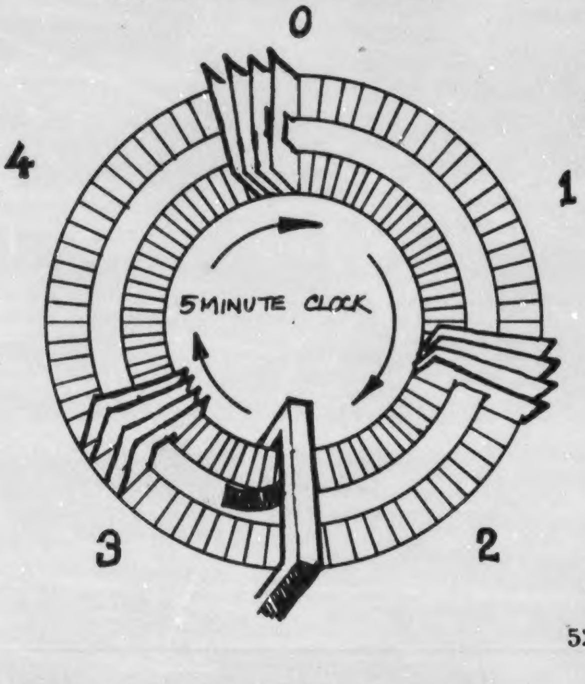


CORRECT RESPONSES

1. 9 AM
2. 8 PM
3. 2 AM

PRACTICE EXERCISE

What is the time interval and length of mist emission programmed on this clock?



CORRECT RESPONSES

The clock is programmed at a 20 x 5 or 100 second interval and since each tab represents 5 seconds and since 4 tabs were used at each interval, it will allow a 4 x 5 or 20 second emission of mist at each interval.

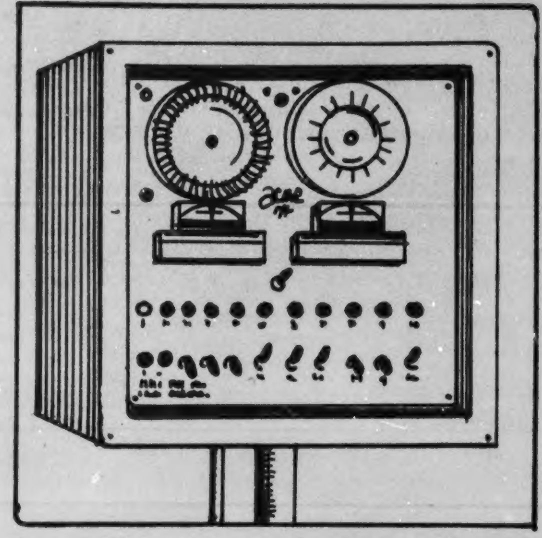


Figure 2. More complex timing systems allow for more flexibility in timing. Such systems often control several satellite stations or greenhouses. Often the water, lighting and heating systems of several greenhouses are controlled by such timers.

STUDENT SELF-CHECK

DO NOT WRITE ON THIS SHEET.

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

Answer True or False.

1. Time clocks can help prevent overwatering of cuttings by a mist system.

   True ___ False ___

2. Once adjusted, the length of the timing cycle for a mist system will not have to be readjusted during the rooting of a batch of cuttings.

   True ___ False ___

3. The 24 hour time clock acts as a switch to turn on or turn off the electric

current to the short interval timer.

True ___ False ___

4. The short interval timer regulates the interval (length of time) that the mist cycle remains on; it also regulates the interval between mistings.

True ___ False ___

5. In setting the time of day on the time clock, consideration must be given to whether it is A.M. or P.M.

True ___ False ___

6. There is no electrical hazard or danger in regulating the electric time clocks in a mist system.

True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CHECK-OUT ACTIVITY

The statement below explains the activity you must be able to complete in order to finish this package. As you go through this activity, your instructor will rate your performance using the Instructor's Final Checklist, SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM.

Your instructor will indicate the time settings and provide the mist propagation system. Set the clocks.

CORRECT RESPONSES

1. True 2. False 3. True 4. True 5. True 6. False

DO NOT WRITE ON THIS SHEET

LAP 52

Student ______________________

Date ______________________

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

Instructor's Final Checklist

Check the student's performance in the following elements of setting time clocks for automatic mist propagation system.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. For each of the five different time interval settings, the clocks were set so the system functioned accurately with no more than 10 percent variation from the prescribed time interval.	[ ]	[ ]	[ ]	[ ]
2. The proper electrical safety precautions were observed.	[ ]	[ ]	[ ]	[ ]

REFERENCES

BOOKS

Approved Practices in Beautifying the Home Grounds, 3rd ed., Hoover, Norman, The Interstate Printers and Publishers, Danville, Illinois, 1966.

Ball Red Book, 13th ed., George J. Ball, Inc., Box 335, West Chicago, Illinois 61985, 1975.

Fertilizing Farm Crops, Vol. 13, South Carolina Department of Education, Columbia, South Carolina, 1961.

Flower and Plant Production in the Greenhouse, Nelson, Kennard S., The Interstate Printers and Publishers, Inc., Danville, Illinois, 1967.

Greenhouse Flower and Bedding Plants for Agribusiness Studies, Williams, G. S., The Interstate Printers and Publishers, Danville, Illinois, 1975.

Planning for An Individual Water System, The American Association for Vocational Instructional Materials (AAVIM), Engineering Center, University of Georgia, Athens, Georgia.

The Greenhouse Worker, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, Ohio, 1974.

BULLETINS

"Cornell Peat-Lite Mixes for Commercial Plant Growing," Information Bulletin 43, Cooperative Extension Service, New York State College of Agriculture at Cornell University, Ithaca. New York.

LAP 2

Student ____________________________

Date ____________________________

ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS

Instructor's Final Checklist

Check the student's performance in the following elements of analyzing soil samples to determine pH levels.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Readings on the three samples agreed within ± 0.1 pH unit.	[ ]	[ ]	[ ]	[ ]
2. Reading agreed with the recorded reading.	[ ]	[ ]	[ ]	[ ]
3. All equipment was cleaned and dried prior to re-use or storage.	[ ]	[ ]	[ ]	[ ]

LAP 3

Student ______________________

Date ______________________

ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALT CONTENT

Instructor's Final Checklist

Check the student's performance in the following elements of analyzing soil samples to determine soluble salt content.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Directions were correctly followed in using the testing equipment.	☐	☐	☐	☐
2. Using a prepared and pre-determined sodium standard solution, a check showed a variation of no more than plus or minus 5 percent.	☐	☐	☐	☐
3. Using the chart for interpreting soluble salt tests, ppm salts were correctly calculated.	☐	☐	☐	☐
4. Test equipment was cleaned and stored correctly.	☐	☐	☐	☐

LAP 4

Student ______________________

Date ______________________

SHREDDING PLANTING MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of shredding planting media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. All safety precautions were followed.	☐	☐	☐	☐
2. Medium was shredded uniformly and thoroughly.	☐	☐	☐	☐
3. Medium from the shredder was properly stored.	☐	☐	☐	☐
4. All debris was properly disposed of.	☐	☐	☐	☐
5. Machine was cleaned.	☐	☐	☐	☐

LAP 5

Student ______________________

Date ______________________

SCREENING PLANTING MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of screening planting media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Medium was pulverized.	☐	☐	☐	☐
2. Medium was free of				
(a) clods	☐	☐	☐	☐
(b) rocks	☐	☐	☐	☐
(c) sticks	☐	☐	☐	☐
(d) grass	☐	☐	☐	☐
(e) leaves	☐	☐	☐	☐
(f) other debris	☐	☐	☐	☐
3. Area was left clean and all equipment cleaned and stored.	☐	☐	☐	☐

LAP 6

Student ______________________

Date ______________________

MIXING MEDIA MATERIALS

Instructor's Final Checklist

Check the student's performance in the following elements of mixing media materials.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	Ingredients were measured accurately for the specified ratio.	☐	☐	☐	☐
2.	Allowance was made for shrinkage in mixing ingredients of different particle size.	☐	☐	☐	☐
3.	If dry peat moss was used in the mix, sufficient water was added to keep down dust and aid in handling.	☐	☐	☐	☐
4.	A uniform mix was obtained, with no color or textural differences evident.	☐	☐	☐	☐
5.	Medium was stored properly.	☐	☐	☐	☐

LAP 10

Student ______________________

Date ______________________

MIXING FERTILIZERS INTO MEDIA

Instructor's Final Checklist

Check the student's performance in the following elements of mixing fertilizers into media.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The medium and fertilizer were mixed in the ratio called for.	☐	☐	☐	☐
2. The mixture of fertilizer and medium was uniform.	☐	☐	☐	☐

LAP 26

Student ______________________

Date ______________________

REMOVING ROOTED CUTTINGS

Instructor's Final Checklist

Check the student's performance in the following elements of removing rooted cuttings.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The cuttings were free of damage caused by removing them from the rooting bed or flat.	☐	☐	☐	☐
2. The roots of cuttings were kept moist.	☐	☐	☐	☐
3. All of the cuttings selected had satisfactory root systems.	☐	☐	☐	☐
4. The correct number of cuttings (25) was selected.	☐	☐	☐	☐
5. The cuttings were stored at appropriate temperature.	☐	☐	☐	☐
6. The work area was cleaned.	☐	☐	☐	☐

LAP 27

Student ______________________

Date ______________________

PACKAGING CUTTINGS FOR SHIPMENT

Instructor's Final Checklist

Check the student's performance in the following elements of packaging cuttings for shipment.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The cuttings were correctly identified.	☐	☐	☐	☐
2. The count was correct.	☐	☐	☐	☐
3. The cuttings were uniform and of good quality.	☐	☐	☐	☐
4. All cuttings were packed so as to prevent drying out or other damage.	☐	☐	☐	☐
5. The packaging and labeling were neat and orderly.	☐	☐	☐	☐

LAP 28

Student ______________________

Date ______________________

LABELING PLANTS OR CUTTINGS

Instructor's Final Checklist

Check the student's performance in the following elements of labeling plants or cuttings.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). **If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.**

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Each variety of cuttings or plants in the flats was correctly identified.	☐	☐	☐	☐
2. All labels were neat and legible.	☐	☐	☐	☐
3. The labeling was systematic, with each label inserted so the plants it represents is in back of and to the right of the label.	☐	☐	☐	☐
4. A weather-resistant type of marking was used on the labels.	☐	☐	☐	☐

LAP 29

Student ______________________

Date ______________________

PINCHING FLOWERING PLANTS

Instructor's Final Checklist

Check the student's performance in the following elements of pinching flowering plants.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The correct amount of the plants was removed in pinching.	☐	☐	☐	☐
2. The foliage which remained was undamaged by the pinching.	☐	☐	☐	☐
3. The severed tips and leaves were placed in receptacle provided.	☐	☐	☐	☐

LAP 30.

Student ______________________________

Date ______________________________

DISBUDDING FLOWERING PLANTS

Instructor's Final Checklist

Check the student's performance in the following elements of disbudding flowering plants.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

Student Performance			
Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished

1. The plants were disbudded correctly to satisfy the purpose for which the plants were being grown.
2. The thumb and forefinger were used to systematically remove the buds.
3. The buds that were removed were disposed of according to instructions.

LAP 45

Student ______________________________

Date ______________________________

REPAIRING BROKEN PIPES, SPRINKLER HEADS, MIST HEADS AND/OR VALVES

Instructor's Final Checklist

Check the student's performance in the following elements of repairing broken pipes, sprinkler heads, mist heads and/or valves.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. All malfunctions were identified.	[ ]	[ ]	[ ]	[ ]
2. Water supply was cut off.	[ ]	[ ]	[ ]	[ ]
3. Clogged sprinkler or mist head was cleaned and set.	[ ]	[ ]	[ ]	[ ]
4. Damaged parts were replaced.	[ ]	[ ]	[ ]	[ ]
5. System was tested and adjusted.	[ ]	[ ]	[ ]	[ ]
6. Tools and equipment were cleaned and stored.	[ ]	[ ]	[ ]	[ ]

LAP 47

Student ____________________

Date ____________________

APPLYING LIQUID FERTILIZER

Instructor's Final Checklist

Check the student's performance in the following elements of applying liquid fertilizer.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	Proper amount of water was determined.	☐	☐	☐	☐
2.	Fertilizer was injected into the irrigation system.	☐	☐	☐	☐
3.	The correct amount of water was applied.	☐	☐	☐	☐
4.	Injection system and irrigation system was cleaned.	☐	☐	☐	☐
5.	Materials and tools were properly stored.	☐	☐	☐	☐

LAP 52

Student ____________________

Date ____________________

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

Instructor's Final Checklist

Check the student's performance in the following elements of setting time clocks for automatic mist propagation system.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. For each of the five different time interval settings, the clocks were set so the system functioned accurately with no more than 10 percent variation from the prescribed time interval.	[ ]	[ ]	[ ]	[ ]
2. The proper electrical safety precautions were observed.	[ ]	[ ]	[ ]	[ ]

LAP 53

Student ______________________

Date ______________________

REGULATING TRICKLE IRRIGATION SYSTEM (OOZE SYSTEM)

Instructor's Final Checklist

Check the student's performance in the following elements of regulating trickle irrigation system (ooze system).

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	The proper reading was determined.	[ ]	[ ]	[ ]	[ ]
2.	The regulator was adjusted to desired setting.	[ ]	[ ]	[ ]	[ ]
3.	The system was in operation during the adjustment period.	[ ]	[ ]	[ ]	[ ]
4.	The system was free of leaks.	[ ]	[ ]	[ ]	[ ]
5.	The final adjustments were made.	[ ]	[ ]	[ ]	[ ]

STUDENT SELF-CHECK

ANALYZING SOIL SAMPLES TO DETERMINE pH LEVELS

Answer the following:

1. A measure of the soil's acidity or alkalinity is called ________________.
2. The neutral point on the pH scale is___.
3. Numbers below the mid-point on the pH scale indicate that the soil is_________.
4. Numbers above the mid-point on the pH scale indicate that the soil is_________.
5. A material which will raise the pH when added to the soil is ________________.
6. A material which will lower the soil pH is ____________________.
7. In preparing soil samples for testing, ____ parts of distilled water are added to each 1 part of soil.
8. Soil sample and distilled water mixtures should be allowed to stand _____ minutes after mixing, before completing the test.

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. pH
2. 7.0
3. acid
4. alkaline
5. lime (or limestone)
6. sulphur (iron sulfate, aluminum sulfate)
7. 2
8. 30

STUDENT SELF-CHECK

ANALYZING SOIL SAMPLES TO DETERMINE SOLUBLE SALT CONTENT

Answer the following True or False.

1. The flower or foliage plant grower can easily detect the presence of excess soluble salts in the soil from disease symptoms in the plants.

   True ___ False ___

2. The Solu-Bridge test for soluble salts will indicate to the grower the kind of analysis of fertilizer to use.

   True ___ False ___

3. When analyzing soil samples, materials used in the tests should be at a uniform, standard temperature.

   True ___ False ___

4. In testing soil or other growing media for excessive soluble salts, tap water is used for mixing with the soil sample.

5. When analyzing for soluble salts by the soil to water volume procedure, the soil sample must be air dry when the test is made.

   True ___ False ___

6. It is possible to remove excess soluble salts from growing media by leaching with large quantities of water.

   True ___ False ___

CORRECT RESPONSES

1. False 2. False 3. True 4. False 5. True 6. True

STUDENT SELF-CHECK

SHREDDING PLANTING MEDIA

Answer True or False.

1. A soil shredder or grinder is designed to reduce the size of large particles of media material to aid in obtaining more uniform plant growth results.

   True ___ False ___

2. Wet, soggy material can be easily shredded and aerated with a soil shredder or grinder.

   True ___ False ___

3. The rate at which material is fed into a shredder or grinder must be carefully controlled to prevent "lugging" or overloading the equipment's engine or motor.

   True ___ False ___

4. Gasoline powered engines must not be operated in an enclosed area.

   True ___ False ___

5. A gas engine powered shredder-grinder is designed to operate at the slowest possible engine speed.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. False 3. True 4. True 5. False

STUDENT SELF-CHECK

SCREENING PLANTING MEDIA

Check the correct answer to each of the following statements.

1. If the medium in which floral crops are grown contains lumps and large particles of debris it can result in
   a. faster and larger growth of plants
   b. uneven or erratic growth of plants
2. When screening soil to remove debris,
   a. breaking up some lumps with the hands may be necessary
   b. it is not advisable to use the hands to break up clods or lumps of soil
3. Usually, sources of supply of clean soil, free of debris, and suitable without screening for use as a plant medium
   a. are readily available
   b. are not readily available
4. When potting plants, if the growing medium contains large lumps or large debris particles, it is
   a. more difficult to place seedlings or rooted cuttings in the pots and firm the medium rapidly
   b. easier to place seedlings or rooted cuttings in the pots and firm the medium rapidly

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. b
2. a
3. b
4. a

STUDENT SELF-CHECK

MIXING MEDIA MATERIALS

Answer True or False.

1. For a satisfactory plant growing medium, it is usually necessary to mix together two or more media materials.

   True____ False____

2. In mixing media materials, to have a satisfactory mixture time after time, accurate measurement of ingredients is important.

   True____ False____

3. When mixing media materials, mixing until there are no color or textural differences is an indication that a thorough mix has been obtained.

   True____ False____

4. Failing to get a uniform mixture when mixing a growing medium cannot cause erratic, uneven growth of plants grown in the medium.

   True____ False____

CORRECT RESPONSES

1. True 2. True 3. True 4. False

STUDENT SELF-CHECK

MIXING FERTILIZERS INTO MEDIA

Place a check mark before the correct answer in each of the following statements.

1. In growing floral plants, an excess of fertilizer in the growing medium would cause
   - a. increased plant growth
   - b. poor plant growth or plant death
2. In mixing fertilizer with soil or other growing media,
   - a. a uniform mix can be obtained with hand tools
   - b. a uniform mix cannot be obtained with hand tools
3. When mixing fertilizer into a growing medium, it is
   - a. necessary to measure or weigh the fertilizer to obtain the proper fertilizer-medium ratio
   - b. not necessary to measure or weigh the fertilizer
4. When mixing fertilizer into a growing medium with hand tools, the pile of material should be turned and mixed
   - a. one time
   - b. about five times

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. b 2. a 3. a 4. b

STUDENT SELF-CHECK

REMOVING ROOTED CUTTINGS

Check the following statements either True or False.

1. Flower cuttings should be removed from the rooting bed or flat as soon as germinated.

   True ___ False ___

2. In lifting flower cuttings from the rooting bench or flat, the roots must receive support from below to prevent being damaged.

   True ___ False ___

3. Rooted cuttings must be kept moist.

   True ___ False ___

4. Refrigeration is not advisable for rooted cuttings which are to be held some time before planting.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. False 2. True 3. True 4. False

STUDENT SELF-CHECK

PACKAGING CUTTINGS FOR SHIPMENT

Check either True or False.

1. In packaging cuttings, an occasional shortage in count is permissible.

   True ___ False ___

2. In packaging cuttings, the cuttings should be uniform in size and quality.

   True ___ False ___

3. In packaging cuttings, they must be protected against drying out.

   True ___ False ___

4. In packing cuttings, excess space in containers should be filled with packing material to prevent cuttings from shifting about.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. False 2. True 3. True 4. True

STUDENT SELF-CHECK

LABELING PLANTS OR CUTTINGS

Answer the following statements.

1. Plants are labeled mainly for the benefit of

   a. the consumer
   b. the grower

2. When typing or writing out plant labels, write from the outside left end toward the middle of the label.

   True ___ False ___

3. Plant labels should be written with a weather-resistant type of marking device.

   True ___ False ___

4. In placing plant identification labels in flats, place the labels

   a. in front of the plants they identify
   b. behind the plants they identify

5. In identifying plants in a flat, place the labels

   a. on the left side of the flat
   b. on the right side of the flat

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. a 2. True 3. True 4. a 5. a

STUDENT SELF-CHECK

PINCHING FLOWERING PLANTS

Check the following statements either True or False.

1. Pinching causes a plant to branch, resulting in a narrow, slender plant.

   True___ False___

2. The shoots that result from pinching a plant are generally longer and weaker than those from a plant which has not been pinched.

   True___ False___

3. Pinching has approximately the same effect on all types of plants.

   True___ False___

4. Proper timing is important for successful pinching results.

   True___ False___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. False 2. False 3. True 4. True

STUDENT SELF-CHECK

DISBUDDING FLOWERING PLANTS

1. The only tool required for disbudding is the worker's hand.

   True ___ False ___

2. Disbudding usually refers to removing lateral buds to allow the terminal bud to more fully develop.

   True ___ False ___

3. Easter lilies are usually disbudded more often than any other flower crop.

   True ___ False ___

4. The specific purpose for which the flower crop is being produced will determine how it is to be disbudded.

   True ___ False ___

5. Disbudding can be done chemically by applying Cycocel approximately two weeks after the buds start forming.

   True ___ False ___

6. In the disbudding process, the worker should remove the terminal bud first and then systematically move down the plant.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. True 3. False 4. True 5. False 6. False

STUDENT SELF-CHECK

REPAIRING BROKEN PIPES, SPRINKLER HEADS, MIST HEADS AND/OR VALVES

Answer the following.

1. The more mechanized an operation is the more chance of break down.

   True ___ False ___

2. Which are more prone to become clogged?

   a. the mist sprinkler system
   b. the ooze system

3. Copper pipe is the only kind of pipe that can be used in greenhouse operations.

   True ___ False ___

4. Not only are leaks wasteful of water, they also make areas muddy and difficult to work in.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. mist sprinkler system 3. False 4. True

STUDENT SELF-CHECK

APPLYING LIQUID FERTILIZER

Answer the following.

1. Which of the following forms of fertilizer is easier to apply for most floricultural crops?

   a. granular
   b. liquid

2. Which of the following forms of fertilizer can be applied most uniformly?

   a. liquid
   b. granular

3. If not cleaned out, the injector system and irrigation system may corrode.

   True ___ False ___

4. Which of the following fertilizer ingredients would be least water soluble and therefore best applied in the solid (granular) form?

   a. nitrogen
   b. phosphorus, potassium

5. Of the three systems used, pump, siphon or injector, the best one is the injection system.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. b 2. a 3. True 4. b 5. True

STUDENT SELF-CHECK

SETTING TIME CLOCKS FOR AUTOMATIC MIST PROPAGATION SYSTEM

Answer True or False.

1. Time clocks can help prevent overwatering of cuttings by a mist system.

   True ___ False ___

2. Once adjusted, the length of the timing cycle for a mist system will not have to be readjusted during the rooting of a batch of cuttings.

   True ___ False ___

3. The 24 hour time clock acts as a switch to turn on or turn off the electric current to the short interval timer.

   True ___ False ___

4. The short interval timer regulates the interval (length of time) that the mist cycle remains on; it also regulates the interval between mistings.

   True ___ False ___

5. In setting the time of day on the time clock, consideration must be given to whether it is A.M. or P.M.

   True ___ False ___

6. There is no electrical hazard or danger in regulating the electric time clocks in a mist system.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. False 3. True 4. True 5. True 6. False

STUDENT SELF-CHECK

REGULATING TRICKLE IRRIGATION SYSTEM (OOZE SYSTEM)

Answer the following:

1. Mechanical or automatic watering systems, such as the ooze system, can lower the cost of labor and production.

   True ___ False ___

2. The amount of water that is put out in an ooze system is__________related to the pressure of the water.

   a. inversely
   b. directly

3. Which is better for watering pot plants?

   a. the ooze system
   b. the chapin tube

4. The ooze system does a good job of watering foliage.

   True ___ False ___

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. True 2. directly 3. the chapin tube 4. False

TESTING COOLANT

Answer the following:

1. The coolant level should be inches below the neck of the radiator tank.

2. Why should the cooling system never be completely filled to the top?

3. Which of the following instruments is used to test the freezing protection of the coolant?

   a. Dynamometer
   b. Micrometer
   c. Hydrometer
   d. Hygrometer
   e. Tachometer

4. What may happen if you pour cold water into a hot engine?

5. Why should antifreeze never be mixed (alcohol and ethyline glycol)?

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next Learning Activity.

CORRECT RESPONSES

1. 1/2 to 2 inches

2. The pressurized system needs space for heat expansion without overflowing.

3. c

4. You might crack the head or cylinder block.

5. The freezing protection reading will not be accurate.

PRESSURE TESTING THE COOLING SYSTEM

Answer the following:

1. A minor leak in the radiator has been found. The student should remove the radiator and solder the hole before reinstalling. (True or False)

2. When visually inspecting the radiator, the tubes should be checked for:
   a.
   b.
   c.
   d.

3. What is the advantage of a pressure type cooling system?

4. Which of the following is not a function of the radiator cap?

   a. Helps prevent rusting of the radiator by keeping out oxygen.
   b. Prevents coolant escape at normal pressures.
   c. Allows atmosphere pressure to enter the cooling system.

5. Why should the radiator cap always be removed slowly and carefully?

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next Learning Activity.

CORRECT RESPONSES

1. False—Only experienced radiator repairer should attempt to repair radiators.
2. a. Helps prevent rusting of the radiator by keeping out oxygen.
   b. Prevents coolant escape at normal pressures.
   c. Allows atmospheric pressure to enter the cooling system.
3. It permits operating the engine at a higher temperature without boiling the coolant or losing it by evaporation.
4. a
5. To avoid a possible fast discharge of hot coolant.

STUDENT SELF-CHECK

CLEANING THE COOLING SYSTEM

Answer the following:

1. Describe a simple test for a clogged radiator core.

2. To examine a cooling system for cleanliness scrape a finger around the inside of radiator neck for the accumulation of ________ or ________ muck.

3. The appearance of ________ ________ in radiator indicates either the corrosion inhibitor has worn out or the system was ________ ______ with an inhibitor.

4. Why should the thermostat be removed when cleaning the system?

5. It is of little importance to clean insects and dirt from radiator air passages. (T or F)

6. Name the major parts of the cooling system.

CORRECT RESPONSES

1. Clogged radiators will have cold spots immediately after engine operation.

2. Rust or Oily

3. Rusty Water, Not Treated

4. The thermostat would block the free flow of water in the cooling system.

5. False

6. Water jacket, radiator, water pump, fan, fan belt, thermostat, water hose.

CLEANING A COOLING SYSTEM

Answer the following:

1. What causes deposits in a cooling system? How can they be prevented?
2. Plain water is a satisfactory engine coolant in warm weather. (T or F)
3. "Permanent" anti-freeze never wears out. (T or F)
4. Why must the thermostat be removed when flushing the cooling system?

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next Learning Activity.

CORRECT RESPONSES

1. Hard water; use soft water, avoid leaks, avoid overfilling.
2. False
3. False
4. To allow clean water to flow through all the cooling system

STUDENT SELF-CHECK

REPLACING RADIATOR HOSES

Answer the following:

1. In what ways do radiator hoses show damage?
2. How often should hoses be examined?
3. Deterioration of hose usually takes place from the outside more than inside. (T or F)
4. Hardening of old hose causes little or no trouble with relation to leaking. (T or F)
5. Excessive heat and water cause limited service life of water hose. (T or F)
6. Engine vibration will not loosen hose connections or cause abnormal wear. (T or F)
7. In what way will hose failures cause clogged radiator?
8. Leaks are more common at connections than anywhere else in the cooling system.

CORRECT RESPONSES

1. Hardening, cracking, swelling, and softening
2. At least twice a year
3. False
4. False
5. True
6. False
7. Rubber particles from rotted hose linings will clog radiator water tubes.
8. Radiator hose

STUDENT SELF-CHECK **LAP 39**

REPLACING A FAN BELT

1. Briefly explain the function of the fan belt.

2. Which of the following might be driven by the fan belt?

   a. fan
   b. water pump
   c. crankshaft
   d. generator
   e. hydraulic pump

3. The tighter the fan belt, the better. (True or False)

CORRECT RESPONSES

1. The fan belt serves to operate the water pump, fan, generator and hydraulic pump.

2. all but c

3. False. A fan belt should be tightened to manufacturer's specifications.

STUDENT SELF-CHECK

UNDERSTANDING WATER PUMPS

Answer the following:

1. What is the most common type of water pump?
2. What is the likely result of water pump failure?
3. How are most water pumps driven?

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next Learning Activity.

CORRECT RESPONSES

1. Centrifugal
2. Engine overheating
3. By the fan belt

TABLE I – HYDRAULIC TEST RESULTS

Tractor Model________________________ Owner__________________________

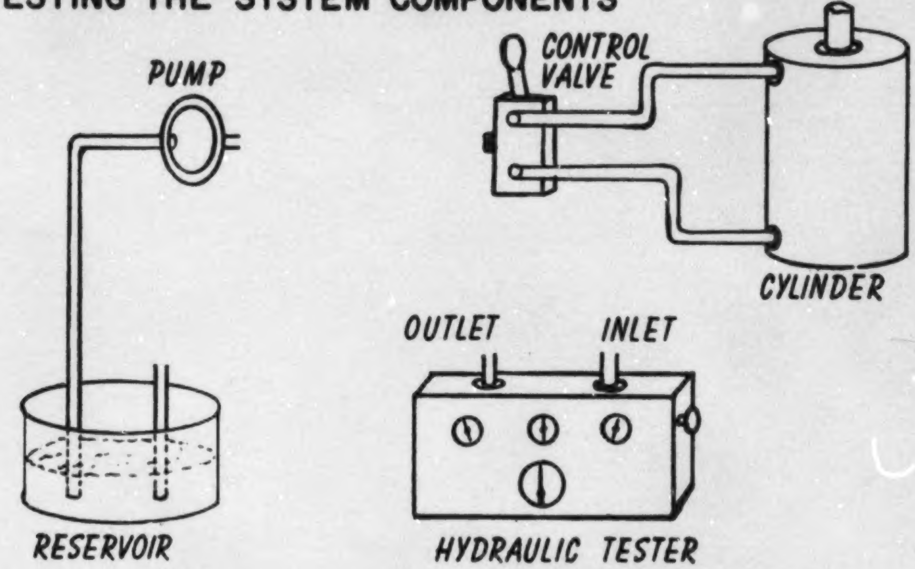
Serial Number________________________ Comments_______________________

Equipment Used________________________

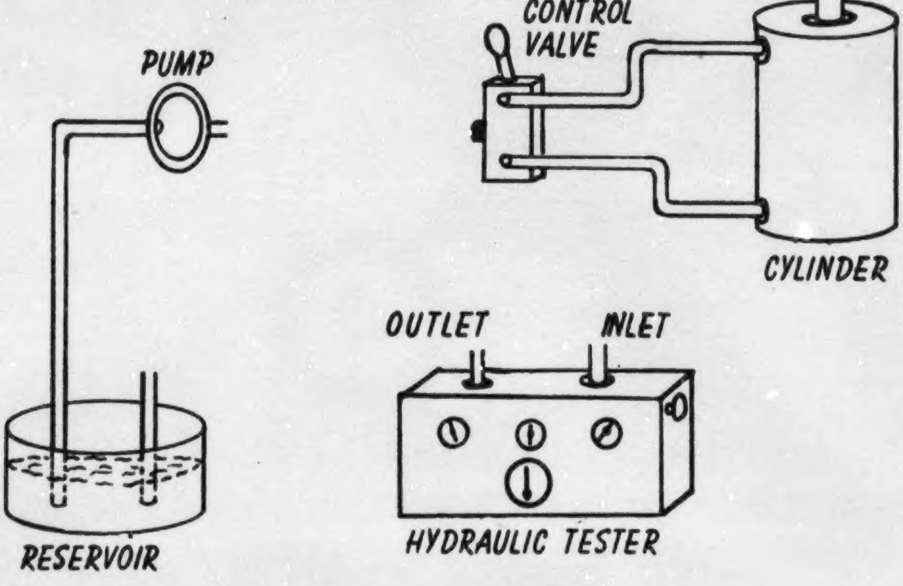
		GALLONS PER MINUTE @ PSI							
		0	250	500	750	1000	1250	1500	1750
Pump Test									
Circuit Test	Direction Cylinder Travel								

ATTACHING THE HYDRAULIC TESTER

1. Draw in the lines from the inlet and the outlet of the hydraulic tester to the correct lines in the system for proper testing.



TESTING THE SYSTEM COMPONENTS

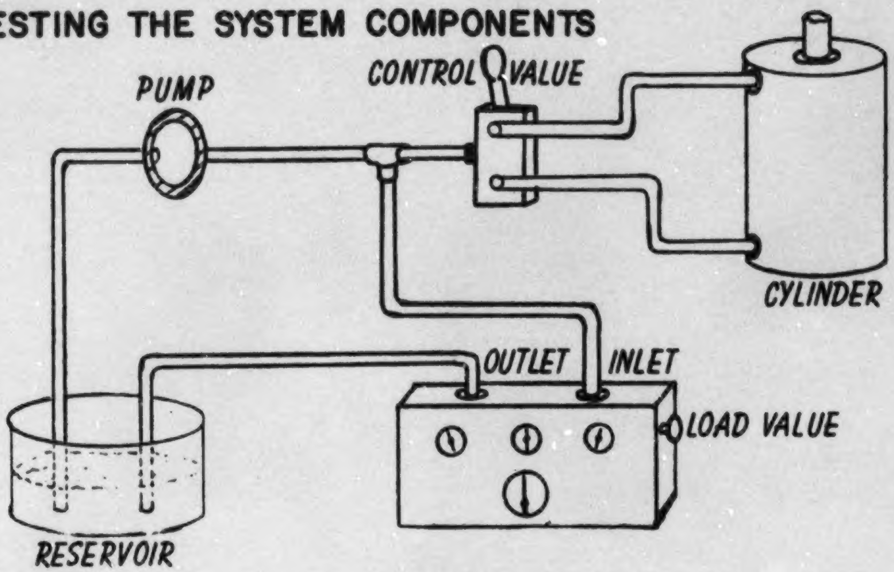


TESTING THE HYDRAULIC PUMP

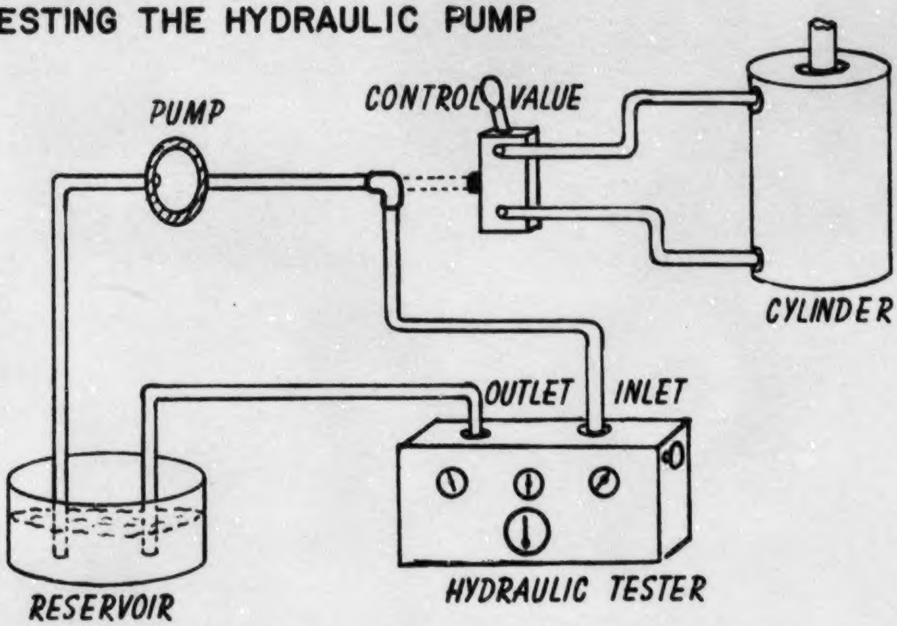
(Continued on the next page.)

Compare your drawing with the correct diagram below. Make sure you understand how to attach a hydraulic tester before going on to the next learning activity.

TESTING THE SYSTEM COMPONENTS



TESTING THE HYDRAULIC PUMP



(Continued on the next page.)

Answer the following questions. Then compare your answers with those at the bottom of the page.

2. Test the hydraulic system flow first so that you have a guide for reading on the pump flow test. (True or False)

3. What is the worst enemy of the hydraulic system? ____________________

4. How do you know if a hydraulic circuit is good? ____________________ ____________________

5. If the flow drops the same on all circuits, what would you expect the trouble to be? ____________________ ____________________

Answers

2. False. Test the pump first. It is the generating force for the whole system and affects the operation of all other system components.
3. Dirt
4. If the circuit's flow is the same as for the pump.
5. The relief valve may be malfunctioning.

MAINTAINING FLUID IN THE HYDRAULIC SYSTEM

Answer the following:

1. What are the four maintenance problems repairers discover most often when answering a customer's complaint?

   a.
   b.
   c.
   d.

2. To flush the hydraulic system, use a non-petroleum solvent or a chemical cleaner. (True or False)

3. Thermal expansion is caused by oil expanding as a result of __________.

4. Match the following oil conditions with their causes:

a.	Foaming oil	1.	Heat
b.	Scorched oil	2.	Water
c.	Milky oil	3.	Air

5. Why is it so important to keep the working area clean?

6. Additives in hydraulic oil help to __________.

7. Which of the following is not a way to prevent air from entering the system?

   a. Keep reservoir at correct level
   b. Replace leaky suction lines
   c. Tighten leaky connections
   d. Keep your work area clean
   e. Bleeding system after repair

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. Not enough oil in the reservoir, clogged or dirty oil filters, loose intake lines, and incorrect oil in the system.
2. False — use a hydraulic oil as a flushing agent
3. Heat
4. a.–3, b.–1, c.–2
5. To keep the hydraulic system free of sludge, sediment, and gum or lacquer formations.
6. Keep contaminants from damaging or plugging the system.
7. d

Student Self-Check I

UNDERSTANDING HYDRAULIC PUMPS

Answer the following:

1. Hydraulic pumps convert __________ force into __________ power.

2. A hydraulic pump creates flow, not pressure. (True or False)

3. Hydraulic pumps work on a principle called displacement. The two types of displacement are __________ and __________.

4. Which type of dispalcement is used in modern hydraulic pumps?

   Why?

5. The three types of hydraulic pumps are __________, __________ and __________.

6. What are the differences between an external gear pump and an internal gear pump?

7. Label the following sketches as to whether they are balanced or unbalanced vane pumps.

a. __________ b. __________

8. If the pistons of a piston pump are mounted in lines parallel with the pump's axle, it is a __________ piston pump.

9. If the pistons of a piston pump are set perpendicular to the pump's center, it is a __________ piston pump.

10. The swashplate in a piston pump can be stationary or movable. (True or False)

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. Mechanical, hydraulic
2. True
3. Positive and non-positive
4. Positive, provides a full flow or fluid through the system by preventing feedback
5. Vane, gear, and piston
6. Internal pump has two gears — one positioned and inside the other.
   External pump has two gears positioned in mesh with each other.
7. a. Unbalanced
   b. Balanced
8. Axial piston pump
9. Radial piston pump
10. True

SERVICING A HYDRAULIC MOTOR

1. What are the three basic types of hydraulic motors?
   a.
   b.
   c.

2. How does the hydraulic pump differ from the hydraulic motor?

3. The hydraulic motor converts a __________________ force into a ____________ force.

4. A pump can generally be used as a motor. (True or False)

5. What is meant by "torque" of a motor?

ANSWERS:

1. a. vane motors b. gear motors c. piston motors
2. The hydraulic motor works in reverse when compared to a pump. The pump draws in fluid and pushes it out, on the other hand, the motor has fluid forced in, but exhausts it out. The pump drives its fluid, while the motor is driven by its fluid.
3. a. fluid b. mechanical
4. False. It takes some changeover. To avoid trouble, use pumps as pumps and motors as motors.
5. Torque is a measure of the turning force exerted at the outer edge of the motor drive shaft.

STUDENT SELF-CHECK

HYDRAULIC-ASSIST TRANSMISSIONS

1. Must tractors equipped with hydraulic-assist transmissions be stopped before shifting?

2. The gear train on a hydraulic-assist transmission usually takes two forms; they are _____ and _____.

3. In a hydraulic-assist transmission, the disks are splined to the _______ , and the plates are splined to the _______.

4. To engage a gear, the fluid engages a pack of friction disks and plates called _________.

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. No

1. No

2. Countershaft
   Planetary
3. Input drum
   Output hub
4. Hydraulic clutch

STUDENT SELF-CHECK

HYDRAULIC PUMPS AND MOTORS

Answer the following:

1. The three major parts of a hydrostatic drive are:

   a. ______________________________

   b. ______________________________

   c. ______________________________

2. The two types of pumps are:

   a. ______________________________

   b. ______________________________

3. Why is it necessary to cover all openings and hose ends when taking them apart for service?

Compare your answers with the correct responses at the bottom of this page. Review any incorrect answers before going on to the next learning activity.

CORRECT RESPONSES

1. a. pump
   b. oil lines
   c. motor

2. a. fixed displacement pump
   b. variable displacement pump

3. to prevent dirt or dust particles from entering the system and causing wear on the parts

LAP TM–34

Student ______________________

Date ______________________

TESTING COOLANT

Instructor's Final Checklist

Check the student's performance in the following elements of testing coolant.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

In testing radiator coolant, the student:

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	removed the radiator cap	☐	☐	☐	☐
2.	drew the correct amount of coolant into the hydrometer	☐	☐	☐	☐
3.	took a float reading	☐	☐	☐	☐
4.	took a temperature reading	☐	☐	☐	☐
5.	determined the coolant strength	☐	☐	☐	☐
6.	returned coolant to the radiator	☐	☐	☐	☐
7.	recorded reading	☐	☐	☐	☐
8.	flushed the hydrometer with clear water	☐	☐	☐	☐

LAP TM–35

Student ______________________

Date ______________________

TESTING THE COOLING SYSTEM PRESSURE
Instructor's Final Checklist

Check the student's performance in the following elements of testing the cooling system pressure.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
When pressure testing the radiator cap, the student:				
a. carefully removed the radiator cap	☐	☐	☐	☐
b. installed the cap on tester and pumped up pressure until the cap released	☐	☐	☐	☐
c. recorded the reading	☐	☐	☐	☐
d. compared the test reading with specifications	☐	☐	☐	☐
e. determined if the cap was usable	☐	☐	☐	☐
When pressure testing the rest of the cooling system, the student:				
a. installed the tester	☐	☐	☐	☐
b. applied maximum operating pressure	☐	☐	☐	☐
c. inspected for external leaks	☐	☐	☐	☐
d. corrected or labeled all leaks	☐	☐	☐	☐
e. operated the engine and observed the tester gauge for fluctuations	☐	☐	☐	☐
f. removed the tester and reinstalled the radiator cap	☐	☐	☐	☐

LAP **TM–36**

Student ____________________

Date ____________________

CLEANING THE COOLING SYSTEM

Instructor's Final Checklist

Check the student's performance in the following elements of cleaning the cooling system.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
In cleaning the cooling system, the student:				
a. put on protective goggles	☐	☐	☐	☐
b. removed radiator cap	☐	☐	☐	☐
c. drained cooling system	☐	☐	☐	☐
d. disconnected the lower radiator hose	☐	☐	☐	☐
e. removed the thermostat	☐	☐	☐	☐
f. reinstalled the thermostat elbow	☐	☐	☐	☐
g. ran clean water through the system until it ran clear	☐	☐	☐	☐
h. used flushing compound, if necessary	☐	☐	☐	☐
i. reinstalled the thermostat and lower hose	☐	☐	☐	☐
j. refilled the cooling system with proper coolant solution	☐	☐	☐	☐
k. pressure-tested the system	☐	☐	☐	☐

LAP TM–37

Student ____________________

Date ____________________

SERVICING THE THERMOSTAT

Instructor's Final Checklist

Check the student's performance in the following elements of checking the thermostat.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In testing a thermostat, the student:				
a. removed the thermostat	[ ]	[ ]	[ ]	[ ]
b. prepared container of antifreeze with thermometer	[ ]	[ ]	[ ]	[ ]
c. inserted .003" feeler gauge in thermostat	[ ]	[ ]	[ ]	[ ]
d. suspended thermostat in solution	[ ]	[ ]	[ ]	[ ]
e. heated and stirred solution	[ ]	[ ]	[ ]	[ ]
f. recorded initial opening temperature and fully open temperature	[ ]	[ ]	[ ]	[ ]
g. got a recorded reading within 3 degrees of the instructor's	[ ]	[ ]	[ ]	[ ]
h. determined if thermostat should be re-used or replaced	[ ]	[ ]	[ ]	[ ]
i. correctly reinstalled or replaced thermostat	[ ]	[ ]	[ ]	[ ]
2. In replacing a thermostat, the student:				
a. cleaned the area thoroughly	[ ]	[ ]	[ ]	[ ]
b. removed old thermostat	[ ]	[ ]	[ ]	[ ]
c. installed new thermostat, gasket, and housing	[ ]	[ ]	[ ]	[ ]

LAP TM–37

Student ______________________

Date ______________________

SERVICING THE THERMOSTAT

(Continued)
Instructor's Final Checklist

Check the student's performance in the following elements of checking the thermostat.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
d. checked for leaks	[ ]	[ ]	[ ]	[ ]

LAP TM–38

Student ______________________

Date ______________________

REPLACING RADIATOR HOSE

Instructor's Final Checklist

Check the student's performance in the following elements of replacing radiator hose.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In replacing the radiator hose, the student:				
a. drained the coolant	☐	☐	☐	☐
b. removed the old hose	☐	☐	☐	☐
c. cleaned the connections	☐	☐	☐	☐
d. applied sealing compound	☐	☐	☐	☐
e. installed a new hose	☐	☐	☐	☐
f. used new clamps, if needed	☐	☐	☐	☐
g. refilled with coolant	☐	☐	☐	☐
h. checked for leaks	☐	☐	☐	☐
i. corrected any leaks	☐	☐	☐	☐
j. pressure-tested the system	☐	☐	☐	☐
2. The newly installed hose showed no leaks or bulges	☐	☐	☐	☐

LAP TM–39

Student ______________________

Date ______________________

REPLACING A FAN BELT

Instructor's Final Checklist

Check the student's performance in the following elements of replacing a fan belt.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In replacing a fan belt, the student:				
a. released belt tension	☐	☐	☐	☐
b. removed old belt	☐	☐	☐	☐
c. installed new belt	☐	☐	☐	☐
d. checked alignment	☐	☐	☐	☐
e. adjusted tnesion	☐	☐	☐	☐
f. securely tightened all bolts	☐	☐	☐	☐
2. The belt tension was to manufacturer's specifications when rechecked by the instructor	☐	☐	☐	☐

LAP TM – 40

Student ______________________

Date ______________________

REPLACING A WATER PUMP

Instructor's Final Checklist

Check the student's performance in the following elements of replacing a water pump.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In replacing a water pump, the student:				
a. drained cooling system	☐	☐	☐	☐
b. removed water pump	☐	☐	☐	☐
c. coated and installed gasket	☐	☐	☐	☐
d. installed pump according to the manufacturer's procedure	☐	☐	☐	☐
e. torqued bolts	☐	☐	☐	☐
f. filled cooling system and tightened belts	☐	☐	☐	☐
g. pressure-tested cooling system for leaks	☐	☐	☐	☐
2. The replaced water pump did not leak	☐	☐	☐	☐

LAP TM–41

Student ______________________________

Date ______________________________

TESTING THE HYDRAULIC SYSTEM

Instructor's Final Checklist

Check the student's performance in the following elements of testing the hydraulic system.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
In testing the hydraulic system, the student:	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Prepared the tractor for testing by plugging all openings and steam cleaning the tractor hydraulic system	☐	☐	☐	☐
2. Relieved any pressure in the system	☐	☐	☐	☐
3. Obtained recorded readings on the hydraulic tester which were the same as the instructor's	☐	☐	☐	☐
4. Obtained the same analysis on the hydraulic pump test as the instructor	☐	☐	☐	☐
5. Obtained the same results as the instructor for the test of each system circuit	☐	☐	☐	☐
6. Obtained the same diagnosis on the entire hydraulic system as the instructor	☐	☐	☐	☐

LAP TM–42

Student ______________________

Date ______________________

MAINTAINING FLUID IN THE HYDRAULIC SYSTEM
Instructor's Final Checklist

Check the student's performance in the following elements of maintaining fluid in the hydraulic system.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	In draining the hydraulic system, the student:				
a.	Relieved all hydraulic pressure and discharged the accumulator when needed	☐	☐	☐	☐
b.	Drained the system following the manufacturer's specifications and recommendations	☐	☐	☐	☐
c.	Flushed the hydraulic system with recommended fluid	☐	☐	☐	☐
d.	Prevented cleaning solvent from coming in contact with seals and packings	☐	☐	☐	☐
e.	Reinstalled well-cleaned filters or installed the new filters following the service manual procedure	☐	☐	☐	☐
f.	Refilled the hydraulic system with correct oil	☐	☐	☐	☐
g.	Prevented any foreign material from entering the system	☐	☐	☐	☐
h.	Started the engine, warmed the system, and ran equipment through working cycle 4–5 times to bleed air from the system	☐	☐	☐	☐
i.	Rechecked the oil level	☐	☐	☐	☐

LAP TM–43

Student ______________________________

Date ______________________________

SERVICING A HYDRAULIC PUMP
Instructor's Final Checklist

Check the student's performance in the following elements of servicing a hydraulic pump.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In servicing a hydraulic pump, the student:				
a. Removed and disassembled the hydraulic pump from the tractor according to the manufacturer's instructions	[ ]	[ ]	[ ]	[ ]
b. Cleaned and inspected all parts	[ ]	[ ]	[ ]	[ ]
c. Replaced any parts that were worn or damaged	[ ]	[ ]	[ ]	[ ]
d. Reassembled the pump, replacing specified seals and gaskets	[ ]	[ ]	[ ]	[ ]
e. Reinstalled the pump and made necessary adjustments	[ ]	[ ]	[ ]	[ ]
2. The pump operated according to the manufacturer's specifications	[ ]	[ ]	[ ]	[ ]

LAP TM–44

Student ______________________________

Date ______________________________

SERVICING HYDRAULIC VALVES AND FITTINGS

Instructor's Final Checklist

Check the student's performance in the following elements of servicing hydraulic valves and fittings.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In servicing the hydraulic system, the student:				
a. Cleaned and removed defective valve from system	☐	☐	☐	☐
b. Disassembled valve according to manufacturer's service manual	☐	☐	☐	☐
c. Cleaned valve components	☐	☐	☐	☐
d. Coated clean parts with rust inhibiting hydraulic oil	☐	☐	☐	☐
e. Replaced worn parts and reassembled valve	☐	☐	☐	☐
f. Checked valve with hand hydraulic pump	☐	☐	☐	☐
g. Replaced valve in system	☐	☐	☐	☐
2. All circuits of hydraulic system functioned properly	☐	☐	☐	☐
3. In servicing fittings, the student:				
a. Removed pressure from system	☐	☐	☐	☐
b. Replaced old fitting with new fitting	☐	☐	☐	☐
c. Operated system to check for leaks	☐	☐	☐	☐
4. The system did not leak	☐	☐	☐	☐
5. No dirt entered the hydraulic system	☐	☐	☐	☐

LAP TM–45

Student ______________________

Date ______________________

SERVICING A HYDRAULIC CYLINDER

Instructor's Final Checklist

Check the student's performance in the following elements of servicing a hydraulic cylinder.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	The student tested the cylinder with a hydraulic tester and diagnosed the specific problem of the cylinder	☐	☐	☐	☐
2.	The student removed the cylinder from the designated system and disassembled it according to the manufacturer's service manual	☐	☐	☐	☐
3.	All usable parts were cleaned and lubricated	☐	☐	☐	☐
4.	Worn parts were replaced with new, lubricated parts	☐	☐	☐	☐
5.	The student reassembled cylinder and returned it to the system according to the manufacturer's service manual	☐	☐	☐	☐
6.	The cylinder was bled properly	☐	☐	☐	☐
7.	The student checked out the system with the tester to see if the problem was corrected	☐	☐	☐	☐
8.	The system functioned according to specifications	☐	☐	☐	☐

LAP TM–46

Student ____________________

Date ____________________

SERVICING A HYDRAULIC MOTOR

Instructor's Final Checklist

Check the student's performance in the following elements of servicing a hydraulic motor.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In servicing the hydraulic motor, the student:				
a. Used trouble-shooting instructions in manufacturer's service manual to determine problems	☐	☐	☐	☐
b. Followed manufacturer's instructions for removal and disassembly of motor	☐	☐	☐	☐
c. Identified, cleaned, dried, and lubricated all usable parts	☐	☐	☐	☐
d. Replaced any damaged or worn parts	☐	☐	☐	☐
e. Reassembled motor according to manufacturer's instructions and refilled motor with fresh oil	☐	☐	☐	☐
f. Operated the motor and made specified adjustments for pressure, speed, torque, displacement, load, and temperature	☐	☐	☐	☐
2. The motor was free of leaks and was adjusted correctly when the student completed the service operation.	☐	☐	☐	☐

LAP TM–47

Student ______________________

Date ______________________

SERVICING A HYDRAULIC-ASSIST TRANSMISSION

Instructor's Final Checklist

Check the student's performance in the following elements of servicing a hydraulic-assist transmission.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

In servicing a hydraulic-assist transmission, the student:

	Student Performance			
	Not Applicable	**Not Accomplished**	**Partially Accomplished**	**Fully Accomplished**
1. Followed troubleshooting procedure specified in manufacturer's instructions to locate the specific problem	☐	☐	☐	☐
2. Removed and disassembled transmission, keeping it free of dirt and lint	☐	☐	☐	☐
3. Cleaned, inspected, and lubricated all parts, replacing any worn or damaged parts	☐	☐	☐	☐
4. Reassembled transmission following manufacturer's instructions	☐	☐	☐	☐
5. Checked out the system and made any indicated adjustments	☐	☐	☐	☐
6. Made sure the system functioned according to manufacturer's specifications	☐	☐	☐	☐

LAP TM–48

Student ______________________

Date ______________________

SERVICING A HYDRAULIC-DRIVE PUMP AND MOTOR

Instructor's Final Checklist

Check the student's performance in the following elements of servicing a hydraulic-drive pump and motor.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
	In servicing a hydraulic drive pump and motor, the student:				
1.	Tested the system to locate the problem	☐	☐	☐	☐
2.	Disassembled the pump and motor according to the manufacturer's instructions	☐	☐	☐	☐
3.	Cleaned, inspected, and lubricated all parts and replaced any worn or damaged parts	☐	☐	☐	☐
4.	Installed new O-rings, seals, and gaskets	☐	☐	☐	☐
5.	Reassembled pump and motor following manufacturer's instructions, and replaced them in the system	☐	☐	☐	☐
6.	Prevented dirt, lint, and rust from entering the system	☐	☐	☐	☐
7.	Adjusted the system to run at manufacturer's specifications	☐	☐	☐	☐

LAP TM–78

Student ____________________

Date ____________________

SERVICING THE VALVE ASSEMBLY

Instructor's Final Checklist

Check the student's performance in the following elements of servicing the valve assembly.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In grinding the valves, the student:				
a. removed the cylinder head	☐	☐	☐	☐
b. removed the valve springs and keepers	☐	☐	☐	☐
c. removed the valves	☐	☐	☐	☐
d. cleaned valves, guides and seats	☐	☐	☐	☐
e. kept them in the correct order as they were taken out	☐	☐	☐	☐
f. checked the valve stems and guides for wear	☐	☐	☐	☐
g. ground each valve to the specified face angle	☐	☐	☐	☐
h. checked the valves for adequate margin	☐	☐	☐	☐
2. In grinding the valve seats, the student:				
a. cleaned head and seats	☐	☐	☐	☐
b. selected the proper pilot to fit the valve guide	☐	☐	☐	☐
c. dressed the refacing stone to the specified angle	☐	☐	☐	☐
d. refaced the valve seats	☐	☐	☐	☐

LAP TM–78

Student ______________________

Date ______________________

SERVICING THE VALVE ASSEMBLY
(Continued)
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the valve assembly.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
3. In replacing the valve guides, the student:				
a. cleaned head and valves	[ ]	[ ]	[ ]	[ ]
b. measured the valve-stem clearance	[ ]	[ ]	[ ]	[ ]
c. determined which valve stems needed repairing	[ ]	[ ]	[ ]	[ ]
d. removed the bad guides	[ ]	[ ]	[ ]	[ ]
e. replaced the worn guides with new guides	[ ]	[ ]	[ ]	[ ]
4. The replaced valve guides corresponded to the specifications in the manufacturer's service manual	[ ]	[ ]	[ ]	[ ]
5. In testing the valve springs, the student:				
a. cleaned all parts	[ ]	[ ]	[ ]	[ ]
b. kept the springs in the order in which they were taken from the head	[ ]	[ ]	[ ]	[ ]
c. checked the manufacturer's service manual for spring specifications	[ ]	[ ]	[ ]	[ ]
d. tested each spring	[ ]	[ ]	[ ]	[ ]
e. replaced faulty springs	[ ]	[ ]	[ ]	[ ]

LAP TM–78

Student ________________________

Date ________________________

SERVICING THE VALVE ASSEMBLY
(Continued)
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the valve assembly.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

6. After having ground the valves and the valve seats, the student:

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
a. mated each valve to its seat with lapping compound	[ ]	[ ]	[ ]	[ ]
b. removed all lapping compound	[ ]	[ ]	[ ]	[ ]
c. reinstalled the valve springs and keepers in their original places	[ ]	[ ]	[ ]	[ ]
d. reinstalled the head	[ ]	[ ]	[ ]	[ ]
e. adjusted the valves	[ ]	[ ]	[ ]	[ ]

LAP TM–79

Student ____________________

Date ____________________

REPLACING ROCKER ARMS

Instructor's Final Checklist

Check the student's performance in the following elements of replacing rocker arms.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
In replacing the rocker arm, the student:				
a. removed the valve cover	☐	☐	☐	☐
b. removed the rocker arm assembly	☐	☐	☐	☐
c. kept all parts in order as they were removed from the rocker arm	☐	☐	☐	☐
d. inspected the parts for wear	☐	☐	☐	☐
e. installed new parts where needed	☐	☐	☐	☐
f. replaced the assembly	☐	☐	☐	☐
g. adjusted the valves	☐	☐	☐	☐
h. replaced the valve cover	☐	☐	☐	☐

LAP TM – 80

Student ____________________

Date ____________________

ADJUSTING VALVES

Instructor's Final Checklist

Check the student's performance in the following elements of adjusting valves.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In adjusting the valves, the student:				
a. checked the manufacturer's service manual for specifications	☐	☐	☐	☐
b. brought the number one piston to T.D.C. on the compression stroke	☐	☐	☐	☐
c. adjusted the intake and exhaust valves on the number one cylinder	☐	☐	☐	☐
d. followed the firing order in getting the cylinder on the compression stroke for the remaining cylinders	☐	☐	☐	☐
2. After being adjusted by the student, the valves exhibited no pecking	☐	☐	☐	☐
3. The engine ran smoothly	☐	☐	☐	☐

LAP TM–81

Student ______________________

Date ______________________

TESTING ENGINE EFFICIENCY

Instructor's Final Checklist

Check the student's performance in the following elements of testing the engine efficiency.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In testing the engine's compression, the student:				
a. Brought the engine up to normal operating temperature	☐	☐	☐	☐
b. Removed all spark plugs	☐	☐	☐	☐
c. Opened the engine throttle all the way	☐	☐	☐	☐
d. Took a reading with the compression gauge	☐	☐	☐	☐
e. Recorded the compression reading	☐	☐	☐	☐
f. Checked each cylinder for compression	☐	☐	☐	☐
g. Checked specifications for compression	☐	☐	☐	☐
h. Added 1 tsp. of oil to each cylinder if low pressure appeared, and repeated the test	☐	☐	☐	☐
2. In testing the horsepower, the student:				
a. properly connected the dynamometer to the tractor	☐	☐	☐	☐
b. brought the engine up to normal operating temperature	☐	☐	☐	☐
c. took a reading at the rated load speed as given in the manufacturer's service manual	☐	☐	☐	☐

LAP TM–81

Student ______________________________

Date ______________________________

TESTING ENGINE EFFICIENCY, CONTINUED
Instructor's Final Checklist

Check the student's performance in the following elements of testing engine efficiency.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
d. compared the dynamometer reading to the reading given in the manufacturer's service manual	☐	☐	☐	☐
3. In running the dynamometer test, the student followed the manufacturer's instructions in testing for:				
a. Exhaust analysis	☐	☐	☐	☐
b. Smoke analysis (diesel)	☐	☐	☐	☐
c. Carburetor adjustment (gasoline engine)	☐	☐	☐	☐
d. Crankcase blow-by	☐	☐	☐	☐
4. From the test the student decided either to tune-up or to overhaul the engine	☐	☐	☐	☐
5. The student's decision agreed with that of the instructor	☐	☐	☐	☐

LAP TM–82

Student ______________________

Date ______________________

SERVICING THE PISTON ASSEMBLY

Instructor's Final Checklist

Check the student's performance in the following elements of servicing the piston assembly.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	In removing the piston assembly the student:				
a.	marked each piston, rod, and cap with cylinder number (if not already marked)	☐	☐	☐	☐
b.	marked the piston assembly for direction of placement	☐	☐	☐	☐
c.	tapped rod caps loose with a soft-faced hammer	☐	☐	☐	☐
d.	removed piston assembly without damage	☐	☐	☐	☐
2.	The cylinder block, oil passages, and piston contained no grease, dirt, carbon or rust deposits after being cleaned by the student	☐	☐	☐	☐
3.	In measuring the piston-ring end gap the student:				
a.	compressed and inserted a ring into the cylinder	☐	☐	☐	☐
b.	took readings with a feeler gauge at each one inch interval until the lowest point was reached in which the ring would travel	☐	☐	☐	☐
4.	The piston-ring end gap measurement agreed with that of the instructor	☐	☐	☐	☐
5.	Measurement of the piston-ring band clearance agreed with the instructor's reading	☐	☐	☐	☐
6.	The cleaned piston contained no carbon or scratches in the ring grooves	☐	☐	☐	☐

LAP TM–82

Student ____________________

Date ____________________

SERVICING THE PISTON ASSEMBLY
(Continued)
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the piston assembly.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
7. The student replaced the rings on the piston without breaking any rings	☐	☐	☐	☐
8. While installing the piston assembly back into the shop tractor the student:				
a. lightly oiled the piston rings	☐	☐	☐	☐
b. tightened the ring compressor on the piston and rings	☐	☐	☐	☐
c. tapped the piston down into the cylinder with a block of soft wood or soft-faced hammer	☐	☐	☐	☐
d. installed the piston assembly back into the block with the correct side to the front and the rod sealed on the crankshaft	☐	☐	☐	☐

LAP TM–83

Student ____________________

Date ____________________

SERVICING THE PISTON CYLINDER
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the piston cylinder.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	In measuring the cylinder taper, the student:				
a.	inserted a compressed ring into the cylinder by tapping it down one inch from the top with an inverted piston	☐	☐	☐	☐
b.	took readings of end gap at inch intervals down to the lowest point of ring travel	☐	☐	☐	☐
c.	got a final reading which agreed with the instructor's	☐	☐	☐	☐
2.	In removing the cylinder ridge, the student:				
a.	turned the reamer slowly in the direction it cuts	☐	☐	☐	☐
b.	stopped reaming when the ridge was cut enough to remove the piston	☐	☐	☐	☐
c.	cleaned the cylinder before removing the piston from the cylinder	☐	☐	☐	☐
3.	In deglazing a cylinder, the student:				
a.	covered the crankshaft with a clean cloth (if the shaft was still in the engine)	☐	☐	☐	☐
b.	oiled the cylinder hone lightly throughout process	☐	☐	☐	☐
c.	moved the hone up and down in the cylinder at 400 RPM or less during the process	☐	☐	☐	☐

Student ____________________

Date ____________________

SERVICING THE PISTON CYLINDER
(Continued)
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the piston cylinder.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	**Not Accomplished**	**Partially Accomplished**	**Fully Accomplished**
d.	checked work often to guard against overhoning	☐	☐	☐	☐
e.	washed cylinder with detergent and hot water to remove all abrasive particles; then oiled cylinder lightly	☐	☐	☐	☐
4.	In replacing dry sleeves, the student:				
a.	removed grease or cosmoline from the new sleeve	☐	☐	☐	☐
b.	used a "mic" to insure proper size	☐	☐	☐	☐
c.	shrank new sleeve by placing it in a freezer	☐	☐	☐	☐
d.	turned the puller with hand tools when removing the sleeves	☐	☐	☐	☐
e.	cleaned cylinder holes in the block	☐	☐	☐	☐
f.	removed new sleeves from the freezer and inserted them quickly into place	☐	☐	☐	☐
g.	tapped the sleeve into place lightly with a soft-faced hammer	☐	☐	☐	☐
5.	In replacing wet sleeves, the student:				
a.	pulled the sleeve	☐	☐	☐	☐
b.	cleaned the lower sealing ring surface in the block	☐	☐	☐	☐

Student ____________________

Date ____________________

SERVICING THE PISTON CYLINDER
(Continued)

Instructor's Final Checklist

Check the student's performance in the following elements of servicing the piston cylinder.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
c.	measured the cylinder bore for taper and out-of-roundness and rebored and honed if necessary	☐	☐	☐	☐
d.	cleaned deposits from under the flange of sleeve and mating bore in the block and cleaned the lower sealing surfaces in the block	☐	☐	☐	☐
e.	installed a new sleeve without seals to check height at several places (to be certain sleeves were seated squarely)	☐	☐	☐	☐
f.	removed the sleeve and put new seals on the sleeve	☐	☐	☐	☐
g.	lubricated the seal and mating surfaces in the block	☐	☐	☐	☐
h.	placed the sleeve securely in the block	☐	☐	☐	☐
i.	checked for correct liner installation by measuring the out-of-roundness in the liner bore	☐	☐	☐	☐

LAP TM–84

Student ____________________

Date ____________________

INSTALLING CONNECTING RODS

Instructor's Final Checklist

Check the student's performance in the following elements of installing connecting rods.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

1. When installing rod bearings, the student:

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
a. Unbolted the rod caps	☐	☐	☐	☐
b. Removed the caps, noting their position for reassembly	☐	☐	☐	☐
c. Pushed the rods away from the crankshaft	☐	☐	☐	☐
d. "Miked" the crankshaft journals for excessive wear	☐	☐	☐	☐
e. Pried the inserts from the rods and rod caps	☐	☐	☐	☐
f. Removed rod bearings and installed new rod bearings	☐	☐	☐	☐
g. Installed new inserts	☐	☐	☐	☐
h. Reseated the rods on the crankshaft journal	☐	☐	☐	☐
i. Reinstalled the rod caps	☐	☐	☐	☐
j. Torqued to specifications	☐	☐	☐	☐
k. Removed the caps and placed a strip of "plastigage" across the inserts	☐	☐	☐	☐
l. Replaced the caps and torqued to specifications	☐	☐	☐	☐

LAP TM–84

Student ______________________________

Date ______________________________

INSTALLING CONNECTING RODS

Instructor's Final Checklist

Check the student's performance in the following elements of installing connecting rods.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
m.	Removed the cap and measured the plastigage width	[ ]	[ ]	[ ]	[ ]
n.	Cleaned the plastigage from the inserts and journals	[ ]	[ ]	[ ]	[ ]
o.	Lubricated, installed, and torqued the rod caps	[ ]	[ ]	[ ]	[ ]
p.	Bent up lock tabs or installed the lock wires as required	[ ]	[ ]	[ ]	[ ]
2.	The bearing was seated according to specifications	[ ]	[ ]	[ ]	[ ]

LAP TM–85

Student ______________________________

Date ______________________________

INSTALLING A CRANKSHAFT

Instructor's Final Checklist

Check the student's performance in the following elements of installing a crankshaft.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In preparing to install the crankshaft, the student:				
a. Visually inspected the crankshaft for damage	☐	☐	☐	☐
b. Made and recorded three measurements for each bearing journal	☐	☐	☐	☐
c. Compared measurements with the specifications for the crankshaft	☐	☐	☐	☐
d. Recorded the measurements	☐	☐	☐	☐
2. When installing the crankshaft, main bearings and caps, the student:				
a. Installed the main bearing inserts and main cap inserts	☐	☐	☐	☐
b. Installed and torqued the main caps	☐	☐	☐	☐
c. Checked the main bearing clearance with plastigage	☐	☐	☐	☐
3. When installing the front oil seals, the student:				
a. Cleaned the seal bore	☐	☐	☐	☐
b. Applied sealing compound to the outer surface of the seal and installed the seal	☐	☐	☐	☐
c. Reinstalled and torqued the timing cover to specifications	☐	☐	☐	☐

LAP TM–85

Student ______________________

Date ______________________

INSTALLING A CRANKSHAFT

Instructor's Final Checklist

Check the student's performance in the following elements of installing a crankshaft.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
4. When installing the rear main oil seals, the student:				
a. Carefully removed parts to secure access	[ ]	[ ]	[ ]	[ ]
b. Pulled out the old seals	[ ]	[ ]	[ ]	[ ]
c. Properly lubricated the new seals	[ ]	[ ]	[ ]	[ ]
d. Installed and torqued the rear main cap with seal	[ ]	[ ]	[ ]	[ ]
5. The student measured the bearing clearances with plastigage	[ ]	[ ]	[ ]	[ ]

LAP TM–86

Student ______________________________

Date ______________________________

SERVICING THE CAMSHAFT
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the camshaft.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

		Student Performance			
		Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1.	In measuring the camshaft for wear, the student:				
a.	removed and visually inspected the camshaft	[ ]	[ ]	[ ]	[ ]
b.	took and recorded micrometer measurements of each camlobe	[ ]	[ ]	[ ]	[ ]
c.	compared measurements with specifications	[ ]	[ ]	[ ]	[ ]
d.	reinstalled or replaced the camshaft as necessary	[ ]	[ ]	[ ]	[ ]
2.	In replacing the camshaft bearings, the student:				
a.	studied the manufacturer's service manual for reaching the camshaft bearings	[ ]	[ ]	[ ]	[ ]
b.	lined up the oil holes with those in the cylinder block	[ ]	[ ]	[ ]	[ ]
c.	reassembled according to manufacturer's specifications	[ ]	[ ]	[ ]	[ ]
3.	The camshaft turned properly and there was no damage	[ ]	[ ]	[ ]	[ ]

LAP TM–87

Student ______________________________

Date ______________________________

SERVICING THE OIL PUMP
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the oil pump.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In servicing the oil pump, the student:				
a. Drained engine oil	☐	☐	☐	☐
b. Removed parts to make oil pump accessible	☐	☐	☐	☐
c. Removed the oil pan sump retaining bolts	☐	☐	☐	☐
d. Removed the oil pan sump	☐	☐	☐	☐
e. Cleaned and dried the sump	☐	☐	☐	☐
f. Replaced gasket	☐	☐	☐	☐
g. Reinstalled the oil pan sump and bolts	☐	☐	☐	☐
h. Reinstalled other parts	☐	☐	☐	☐
i. Replaced engine oil	☐	☐	☐	☐
j. Ran the engine to check for oil leaks and oil pressure	☐	☐	☐	☐
2. The engine showed no oil leaks	☐	☐	☐	☐

LAP TM–88

Student ______________________________

Date ______________________________

INSTALLING THE TIMING GEARS OR CHAIN

Instructor's Final Checklist

Check the student's performance in the following elements of installing the timing gears or chain.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. When installing the timing gears, the student:				
a. Removed the timing gear cover	☐	☐	☐	☐
b. Cranked engine observing the alignment of the timing marks	☐	☐	☐	☐
c. Unbolted the camshaft gear	☐	☐	☐	☐
d. Pulled the gear from camshaft	☐	☐	☐	☐
e. Reassembled and installed the timing parts with the timing marks correctly aligned	☐	☐	☐	☐
2. All parts were assembled in correct order	☐	☐	☐	☐
3. Timing was to manufacturer's specifications	☐	☐	☐	☐

LAP TM–89

Student ________________________

Date ________________________

REPLACING THE CYLINDER HEAD

Instructor's Final Checklist

Check the student's performance in the following elements of replacing the cylinder head.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In checking the cylinder head and block for warpage, the student:				
a. Laid a straight-edge across the head	☐	☐	☐	☐
b. Checked with a feeler gauge under straight-edge for clearance	☐	☐	☐	☐
c. Checked the block in the same manner as the head was checked	☐	☐	☐	☐
d. Marked all excessive warpage	☐	☐	☐	☐
2. When installing the cylinder head, the student:				
a. Installed a new head gasket	☐	☐	☐	☐
b. Put sealing compound on top of the head gasket	☐	☐	☐	☐
c. Installed and tightened the head bolts using a spiral sequence of 10 ft. lbs. until the specified torque was reached	☐	☐	☐	☐
d. Re-torqued head after a few hours of light duty operation	☐	☐	☐	☐

LAP TM–90

Student ____________________

Date ____________________

REPLACING THE OIL PAN
Instructor's Final Checklist

Check the student's performance in the following elements of replacing the oil pan.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. When replacing the oil pan, the student:				
a. Cleaned sludge and dirt from the oil pan	☐	☐	☐	☐
b. Cleaned all traces of old gasket from the oil pan and engine block	☐	☐	☐	☐
c. Coated the gasket with gasket compound before installing	☐	☐	☐	☐
d. Lifted the pan and gasket carefully into place on the engine	☐	☐	☐	☐
e. Torqued the pan bolts to manufacturer's specifications	☐	☐	☐	☐
2. The oil pan, after being installed by the student, had no leaks	☐	☐	☐	☐

LAP TM-91

Student ______________________

Date ______________________

INSPECTING THE LUBRICANT LEVEL ON A TRACTOR

Instructor's Final Checklist

Check the student's performance in the following elements of inspecting the lubricant level on a tractor.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. In checking engine crankcase oil level, the student:				
a. Placed tractor on level and turned off the engine	☐	☐	☐	☐
b. Pulled out dip stick and wiped dry with clean cloth	☐	☐	☐	☐
c. Reinserted dip stick and seated fully	☐	☐	☐	☐
d. Pulled out dip stick and took a reading	☐	☐	☐	☐
e. Replaced dip stick	☐	☐	☐	☐
f. Obtained same dip stick reading as instructor	☐	☐	☐	☐
2. In checking transmission and/or differential lubricant levels of a tractor with a dip stick, the student:				
a. Pulled out dip stick and wiped with a clean cloth	☐	☐	☐	☐
b. Reinserted dip stick and seated fully	☐	☐	☐	☐
c. Pulled out dip stick and took a reading	☐	☐	☐	☐
d. Replaced dip stick	☐	☐	☐	☐
e. Obtained same dip stick reading as instructor	☐	☐	☐	☐

LAP TM–91

Student ______________________

Date ______________________

INSPECTING THE LUBRICANT LEVEL ON A TRACTOR

Instructor's Final Checklist

Check the student's performance in the following elements of inspecting the lubricant level on a tractor.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
3. In checking transmission and/or differential lubricant levels, the student:				
a. Removed level-check plug	☐	☐	☐	☐
b. Replaced plug when oil flowed out	☐	☐	☐	☐
c. Cleaned surface of filler plug	☐	☐	☐	☐
d. Removed filler plug	☐	☐	☐	☐
e. Checked manufacturer's service manual to determine correct lubricant use	☐	☐	☐	☐
f. Added correct lubricant until oil flowed out from check plug	☐	☐	☐	☐
g. Replaced check plug	☐	☐	☐	☐
h. Replaced filler plug	☐	☐	☐	☐

LAP TM–92

Student ______________________________

Date ______________________________

CHANGING THE CRANKCASE OIL AND FILTER

Instructor's Final Checklist

Check the student's performance in the following elements of changing the crankcase oil and filter.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

In changing the crankcase oil and filter, the student:

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Ran engine until operating temperature reached	[ ]	[ ]	[ ]	[ ]
2. Disconnected coil wire	[ ]	[ ]	[ ]	[ ]
3. Cleaned drain	[ ]	[ ]	[ ]	[ ]
4. Cleaned oil can before inserting spout	[ ]	[ ]	[ ]	[ ]
5. Checked washer or gasket on plug	[ ]	[ ]	[ ]	[ ]
6. Checked for leaks	[ ]	[ ]	[ ]	[ ]
7. Did not over-fill	[ ]	[ ]	[ ]	[ ]

LAP TM–93

Student ____________________

Date ____________________

CHANGING DIFFERENTIAL LUBRICANT

Instructor's Final Checklist

Check the student's performance in the following elements of changing differential lubricant.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

To change the lubricant in the differential of a designated tractor, the student:

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. Cleaned the surface of the filler plug	☐	☐	☐	☐
2. Removed the filler plug	☐	☐	☐	☐
3. Cleaned and removed the drain plug	☐	☐	☐	☐
4. Allowed lubricant to drain for about five minutes into a container	☐	☐	☐	☐
5. Replaced the drain plug	☐	☐	☐	☐
6. Filled to the correct level with the recommended lubricant	☐	☐	☐	☐
7. Reinstalled the fill plug	☐	☐	☐	☐
8. Disposed of used lubricant	☐	☐	☐	☐

Student ______________________

Date ______________________

SERVICING THE OIL COOLER
Instructor's Final Checklist

Check the student's performance in the following elements of servicing the oil cooler.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	Not Accomplished	Partially Accomplished	Fully Accomplished
1. The student removed the oil cooler according to the manufacturer's service manual	☐	☐	☐	☐
2. The oil cooler was cleaned by the student	☐	☐	☐	☐
3. The leaking oil cooler was repaired or replaced	☐	☐	☐	☐
4. The student reinstalled the oil cooler	☐	☐	☐	☐
5. The oil cooler did not leak when recharged	☐	☐	☐	☐

LAP TM–95

Student ______________________________

Date ______________________________

PREPARING A TRACTOR FOR PAINTING

Instructor's Final Checklist

Check the student's performance in the following elements of preparing a tractor for painting.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

In preparing a tractor for painting, the student:

		Student Performance			
		Not Applicable	**Not Accomplished**	**Partially Accomplished**	**Fully Accomplished**
1.	Steam cleaned the tractor	☐	☐	☐	☐
2.	Hammered out all dents, and applied body putty and filler where needed	☐	☐	☐	☐
3.	Sanded rough areas	☐	☐	☐	☐
4.	Cleaned the tractor with compressed air	☐	☐	☐	☐
5.	Masked with masking tape all areas not to be painted	☐	☐	☐	☐
6.	Primed bare spots with rust-inhibiting primer	☐	☐	☐	☐
7.	Applied anti-static solution to surface	☐	☐	☐	☐
8.	Set up tractor in paint room	☐	☐	☐	☐
9.	Visually inspected tractor for readiness of painting	☐	☐	☐	☐

LAP TM–96

Student ______________________

Date ______________________

PAINTING A TRACTOR
Instructor's Final Checklist

Check the student's performance in the following elements of painting a tractor.

Place an X in the appropriate box indicating not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, the item was impossible to complete, place an X in the "Not Applicable" box.

Performance Level: All items must receive a rating of FULLY ACCOMPLISHED (or Not Applicable). If any items are rated Not Accomplished or Partially Accomplished, the student and instructor will discuss this and decide which learning activities must be repeated.

	Student Performance			
	Not Applicable	**Not Accomplished**	**Partially Accomplished**	**Fully Accomplished**
1. In painting the tractor, the student:				
a. prepared the paint room and the paint gun for painting	[ ]	[ ]	[ ]	[ ]
b. prepared the paint	[ ]	[ ]	[ ]	[ ]
c. filled gun reservoir through strainer	[ ]	[ ]	[ ]	[ ]
d. put on respirator	[ ]	[ ]	[ ]	[ ]
e. adjusted gun	[ ]	[ ]	[ ]	[ ]
f. painted tractor	[ ]	[ ]	[ ]	[ ]
g. cleaned gun and put away the equipment	[ ]	[ ]	[ ]	[ ]
2. The completed paint job was smooth, glossy, and free of major runs	[ ]	[ ]	[ ]	[ ]